JOURNAL OF GAS LIGHTING & WATER SUPPLY.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CXXVII., No. 2677.] TUESDAY, SEPTEMBER 1, 1914. [66TH YEAR.

EDITORIAL NOTES.

"Business as Usual."

WHEN the war began, there was an extraordinary display of business pessimism. Some manufacturers and tradesmen commenced at once to groan, and looked around to see where they could retrench. Staffs were reduced, and advertisements and other public announcements were cut off; and everything possible was done by some startled manufacturers and tradesmen to induce people to believe that they did not wish to do business, nor to keep their works and shops going. If ever there was a time when everything possible should have been done to create the opposite impression, even at a little sacrifice, it was at the inception of this unparalleled war. The policy of economy swept like a hurricane through the homes of the people all over the country, due largely to the action of manufacturers and tradesmen themselves. There are, of course, lines of business that are bound to suffer; but there are many lines of business not likely to be greatly affected so long as there is money to be spent. Speaking generally, those manufacturers and those tradesmen who went in unnecessarily for restriction on the first shot being fired were forgetful of what they owe to the country and to the industries in and from which in times of peace they make their profits—and some of them very good profits. Those manufacturers and tradesmen who kept their flags flying in the matter of advertisements, who kept their factory and shop doors wide open for the usual number of hours, and who made no difference whatever in the matter of employment (being fortified by reserves formed in the time of peace) were men who did their patriotic part in helping not only to keep the wheels of the country moving, but to normalize things under abnormal circumstances. It was a good part to take; and yet only the loyal fulfilment of an obligation. But a new spirit has entered into occupation of the place filled by the early pessimism that, here and there, cried and sought for curtailment instead of making a brave effort at business maintenance, if not expansion. To-day the inscriptions "Business as Usual," and "Carry-on" confront wherever one walks; and at the back of these legends are seen the patriotic manufacturer and tradesman who have determined, so long as it can possibly be avoided, not to contribute to the inevitable miseries of his native land.

For most part, in the gas industry, there has been little sign of any idea of business restriction. The gas-supply industry is not contemplating curtailment, but is ready and willing to carry on, and is carrying on, its great public service as usual, and without, if it can "by hook or by crook" be prevented (although its residual markets are bound to suffer), any increase in the price of gas. As to the manufacturers and other business establishments, a few advertisers have fallen out of our pages; but we hope this does not mean they have "put up the shutters," even temporarily. There is no necessity, in major part, for this kind of thing, as their principal customers, the gas undertakings, are now pursuing business in the normal way, so far as the reduced numbers of employees (through the inroads of active service) will permit. There may be some traders in the gas industry, but very few, who have been dependent on foreign supplies, and have now no considerable stock with which to do business. In some cases these traders could get supplies from manufacturers and wholesale houses in this country, and would be contributing to the assurance of their own future position by now keeping their businesses well on the move. Detachment from ordinary customers through the usual channels, even for a time, is bad policy; those customers who transfer their patronage will want some picking up again by those who have dropped them when matters arrive once more at normal state.

Rent-Free Appliances during the War.

As we say, gas undertakings are not likely to seek deliberately any abridgment of their business, but will prosecute it quite in the usual way—at all events, so far as reduced staffs, through the call to the colours, will enable them to do so. They are mostly in the position now to get in plenty of coal; so that there is no need for any attempted contraction of business effort on that ground—in fact, the present affords an opportunity for new business which it will be worth getting even at some immediate sacrifice, in view of its enduring nature. Certain correspondents have privately communicated a few points bearing upon the development and protection of the gas-supply business during the time of the war, which points they think well worth consideration and discussion by our readers. From the suggestions we pick four. The first is the question of the appropriateness of the present time to push with extra vigour the domestic business; the second is as to the best course to take to develop the adoption of fresh appliances; the third and fourth refer to the methods that should be pursued in these times to prevent the return of gas appliances out on hire.

Regarding the first question, a correspondent submits that the gospel of domestic economy has been preached with so much ardour the last two or three weeks that householders are bound to scrutinize very carefully their outgoings, so as to ascertain where, if anywhere, retrenchment can be made. He points out that, in the domestic service, the gas industry has built up its reputation and business on a basis of economy—economy in cost, and through labour and time saving and general utility. Then, surely, if the preachings and teachings of the past, by the British Commercial Gas Association and by gas undertakings, have any foundation in fact, as we know they have, now is a very special opportunity to say to the householder: "Here with this cooker, "or this gas-fire, or this water-heater which you have not "got, you have assured both economy and utility." He feels strongly convinced that now is the time for the British Commercial Gas Association and for gas undertakings to indulge in a vigorous advertising campaign, and more especially as some of the ordinary daily papers are pleased just now to let space for advertisements at a somewhat reduced rate; and while all the newspapers are being so feverishly purchased for the latest war news, it seems appropriate, on account of the extended range of diligent readers, to include in them prominent advertising matter. There is another reason why gas advertising should now be energetically taken up; and it is that people are not (so it is understood) stocking their cellars so liberally, especially in the middle zone of society, as is usually the case at this time of the year—the probability being that they will buy from (so to speak) hand to mouth as fuel is required, rather than lay out a lump sum on the storing of coal. The same end, it is worth while driving home among the people, can be achieved by the use of a gas-fire or two and a gas-cooker. There is no call with them to lay out a large sum on fuel storage as in the case of coal; and the gas need only be used as and when required, without any demand for the payment of the October-December account for it till some time in January. This should certainly appeal to many householders.

Coming to the second, third, and fourth points, the general contention appears to be that, if gas undertakings desire to utilize this time for prospective rather than for immediate benefit, they must be prepared to make some pecuniary sacrifice. It is a question not only of extending the heating and cooking business, but of holding that which is already in hand. Concerning extension of the connections in the cooking and heating lines, it is probable that, in the next few months, more than the usual inducements will have to be offered to householders; and suggested as worthy of consideration is free fixing (under defined conditions) of new and additional appliances ordered during the continuance of the war, or during the first winter quarter, without, too, a rental charge for the same period. The point is emphasized that good treatment in these times is just what will build-up lasting custom. It is felt that gas undertakings have an opportunity of accentuating the public character of their service, and of showing their desire to forfeit something now not only for the present benefit of the consumers, but for the future benefit of their own concerns.

What appears to be, in our correspondents' views, a most

important point is (they would like to have this particularly discussed) the steps to be taken to prevent the return of existing gas appliances. It is feared that, in the quest for directions in which to economize in household expenditure, gas fire, cooker, and water-heater rents will attract the eyes of many a consumer, and that there will be this winter a fair number of returns of appliances on the part of those for whom the economy, the convenience, and the labour-saving attributes of gas methods are not alone sufficient to produce retention. They may see in the rents, where three or four appliances are fixed, a lump sum which they consider might be saved, without paying much regard to the consequences of the dismissal of the appliances. One correspondent makes the suggestion that gas consumers might be encouraged by offering to remit all stove and fire rents where, during the war, the consumption of gas exceeds a given amount. Beyond the complication that this would occasion, there is nothing much to be said against it, though, in a minor degree, some of the arguments that we shall apply to a further suggestion that has been made will apply to this one.

It is rather curious that the foregoing suggestion should have been offered in the same week that another one was made, also privately, on precisely the same point. There is evidently prevailing a certain amount of feeling that there will be, during the period we are boldly facing, a larger number of returns than is normally the case. But this second proposal is of the heroic order. It contemplates the abandoning of all rents for gas appliances during the period of the war, both for those already fixed and for those (as previously suggested) that may be fixed. This correspondent admits that the amount of income lost, considered alone, would be fairly substantial for the time; but, as he puts it, there is a monetary set-off against the loss. There is the cost of the labour involved in disconnecting the appliances and conveying them back to store, the cost of cleaning and of repairing and general renovation before sending out the appliances again, there is the loss of gas consumption, and the profit thereon, there is the severance of business connections, and later on the expense of making re-connections, though not perhaps in all cases. Costs and losses through returns of appliances, in his opinion, would represent more than the temporary loss of the rental if it were sacrificed in the interests of business retention at this particularly abnormal time. The next point that he considers is the moral effect. The consumer with his rent-free appliances will say: "The gas company or committee have come "to my assistance in the time of stress; I shall be a friend "of that company or committee in the easier times ahead." Speaking of municipal gas committees, the same correspondent suggests that they have, instead of handing over in aid of the rates the proportion of gas profits derived from the coming winter's business, a very fine opportunity of benefiting their communities by remitting during the war all rents for hired gas appliances. But who knows whether, without remitting rents, there will be, in all places this coming winter, any surplus profits after meeting interest and sinking fund?

The Other Side of the Shield.

THE suggestions made are interesting; and it would be of further interest to know how many agree with the last stated view as to the unconditional remission of rents for cookers and fires during the war. The question is, Can undertakings afford to relinquish rents? If they can, or if they would be better off in the end by doing so, then there would be no occasion to argue over the matter. But let us look at the proposal from the point of view of probably most gas undertakings. The prices of gas ruling to-day in most districts are based upon the conditions that existed in 1911, before the great coal strike. After that event, the prices were maintained by, for a period, the splendid state of the residuals markets. Then came the break in the market values of residuals; but with an available balance of undivided profit, and the prospect of relief through lower coal prices, gas administrations refrained from raising the price of gas. Next there followed the veritable slump in residuals, resulting, with the high price of coal, in numerous undertakings the past two half years not earning sufficient profit to pay the statutory dividends. This was the pre-war condition. The war is here; and would gas undertakings, who did not earn sufficient for dividend purposes last half year, be able, under current conditions, to afford to give up their rents for cookers, fires, and other appliances? We think not. Coal and oil are cheaper; but there are still stocks of coal to be worked out at the old high prices. The residuals markets are to-day (through the war) in worse plight than last half year. We know generally what this plight represents to-day; we do not know what it may represent to-morrow. There is a prospect, too, that the industrial and shop gas lighting and heating business will show a decline, in comparison with the corresponding period of last year. It is already doing so. The prices current for gas never contemplated the present conditions; and yet gas undertakings are intending to do their part in easing conditions by maintaining these prices. To abandon temporarily under the circumstances the whole of the rentals for gas appliances is something that very few undertakings could really seriously consider. To abandon them would eventually mean for many of them an increase in the price of gas. There are some undertakings whose rent-roll totals to a sum almost equal to the amount required for dividends, and whose accounts last half year, before war conditions for the residuals markets set in, showed a deficit upon the sum required for the statutory dividends. What would be their condition now, if they remitted these rents, with the drop in the industrial and shop lighting and heating business, and a possible greater loss on tar and sulphate of ammonia?

The probable results of the rent-sacrificing proposal are quite in the clouds, just as is hypothetical the number of returns of gas appliances that is contemplated. Will the total loss, all items contributing to it (as previously considered) being included, from the returns amount to anything like the sum of the rental of the appliances that will not be returned? Frankly, we doubt it. This need not be published abroad, but it may be said here, that the rent-remission proposal could be met by, if it was ascertained that the rent was the cause of the order to disconnect and remove a cooker or fire, a private understanding that rent would not be charged, although disconnection would not be made, until later on. With regard to the moral effect of the rent-remission to which one correspondent refers, we are afraid some gas consumers are not in the habit of regarding those from whom they buy in the light of friends; and these consumers, as one result of the forfeiture of the rentals during war time, would, when the charge was restored, turn upon their gas suppliers and benefactors with the facer: "If you can afford to forego your rents during these "times, you can do so when times are more favourable for "such a concession." It is a matter that has to be examined from all politic points of view, and not from one only. And all the expediency that can be brought to bear upon the matter does not, on the larger examination, suggest propriety.

Advertise by all means, and adopt all proper methods of getting new gas-consuming business by holding out the economic advantages that gas offers, and even by resigning rents for newly-fixed appliances until after the first winter's quarter. The wheels of the gas industry must be kept going, and at as fast a rate as is possible. The measure of the success of the gas-supply industry in these times will define the limits of the success of the manufacturers of gas appliances during the immediate months.

B.C.G.A.—Status Quo Ante Bellum.

THE place of managers of concerns rendering a public service such as that of gas supply, and carrying with it in these troubled times a heavier responsibility than usual, is at home and in and about their works and districts until a state of greater serenity is reached by a happy and victorious issue of this country and its allies from the present stupendous war. The Executive Committee of the British Commercial Gas Association last week decided to recommend the General Committee to—not abandon the projected annual conference at Glasgow, but to suspend it for twelve months, and leave the arrangements intact just as they were before the war, holding merely a formal meeting of the subscribers in London on the 27th prox. for the purpose of passing the annual report and accounts.

The Glasgow authorities have, with that characteristic generosity and hospitality of which the gas industry and its institutions, as well as other industries and technical and progressive bodies, have had memorable testimony, heartily fallen in with the proposed suspension which is now submitted for ratification. It would indeed be exceedingly unfair to the Glasgow civic authorities, and to the President of the Association (Bailie Thomas Paxton) if an annual

conference were held in the city that, through current circumstances, did not in point of numbers, enthusiasm, and debate, maintain the high standard that the two previous conferences have set. Anything that fell short of that standard would be a poor compliment to whole-hearted supporters of the Association like the Glasgow Corporation and Gas Committee. The Executive Committee of the Association have unquestionably taken a very prudent step. Bailie Paxton, too, with the devotion that has marked his connection with the Association from its early days, has also consented, though at some personal inconvenience, to continue in the presidential chair until after the annual conference which (the proposals of the Executive Committee being ratified) will now take place in October, 1915, when Bailie Paxton and his colleagues will, we are sure, have the pleasure, under more felicitous conditions than those now prevailing, of welcoming to Glasgow a good muster of men with the commercial progress of the gas industry at heart, and a muster of men who will feel themselves honoured by the reception to be accorded them by a city so distinguished in commercial and industrial progressiveness.

But though the annual conference is being postponed, the Association itself will not lessen its activities. There are publicity opportunities in these times which cannot, and must not, be missed. "Business as usual" is the war-period motto of the Association, just as it is of the gas industry generally. The active Executive, it will be seen from their circular-letter, which is signed by the Chairman (Mr. F. W. Goodenough), are already looking into what can be done in connection with the present and future protection of this country in the matter of incandescent gas mantles and lamp glassware. Further, if anyone has anything suggestive to advance regarding the gas or coke business for their consideration, the Executive Committee will be pleased to receive a communication.

The Welsh Association have abandoned their half-yearly meeting; and the Committee of the Eastern Counties Gas Association also feel that, under present circumstances, they would not obtain a representative gathering for their autumn meeting. Adjournment or abandonment are the alternatives under consideration by them, and determination seems likely to fall on the latter.

"Double" Gas for Small Works.

It would have been a pity if the paper that Mr. C. B. Tully, of Hythe, Kent, had prepared for the Irish Association meeting had been, as was at first proposed, "held up" for twelve months before coming into the light of day, seeing that it deals with a topic having especial current interest in view of the study that is being given everywhere to gas-works economy, and to the question of the relief of the gas residuals markets. Therefore, Mr. Tully did the right thing in withdrawing the paper from the Association, and promising compensation in the shape of a contribution next year (all being well) containing experience which will then be up to date. The withdrawal enabled us to publish the paper in last week's issue; and only pressure of other matters precluded a little discussion of the contents on the same occasion. Another reason why there was appropriateness in an early publication of the paper, was that the subject-matter bears upon the plea of the President of the Irish Association (Mr. J. P. Fitzpatrick) for the consideration of the ways and means of securing greater economies in small gas-works practice, so that they, too, may enjoy a larger business outlook through the aid of cheaper gas.

Mr. Tully entitles the communication "New or 'Double' "Gas for Small Gas-Works;" and the investigation that one is induced to make is as to whether the plant and suggestions that he brings before the managers of small works are really something that will be of value to them. There are some criticisms which no doubt have occurred offhand to others as they did to us on reading the communication, and which perhaps Mr. Tully when he has a little leisure will dispose of quite satisfactorily. Prefacing criticism, it may be remarked that it would be well to drop the word "new" for something that is not in fact "new." In this connection, "new" is a catch term without any claim to propriety. As Mr. Tully himself points out, it is something like a decade ago since he originally constructed a self-contained plant capable of producing water gas and a high-quality coal gas for enriching it. It is also now some years since that Professor H. Strache, through the Patent Office, gave information regarding his proposal to have a water-gas generator and coal-carbonizing retort operating jointly—the water gas from the lower generator, sweeping through the coal-gas retort above, becoming enriched and increased in volume in the one cycle of operations, and thus closely realizing the complete gasification of coal in one process. So that there is nothing "new" in what has now crept among things practical, or is claiming to be practical, under the style of "double" gas. The plant that Mr. Tully advocates is of the twin-generator type, the advantages of which he describes. It incorporates the shallow fuel bed of the Dellwik plant, the "K. & A." double-gas generator system, and the "methane-hydrogen" regenerator and retort chamber; and it can be employed for any kind of gas, whether it be double gas, blue water gas, carburetted water gas, methane hydrogen gas, coal gas, or a mixed coal and producer gas. No single gas plant could claim a greater range of accomplishments than this. The reversal process of gas making is practised; and this has a good effect in eliminating valve troubles, and in helping to maintain uniform conditions. And it would clearly never do, with the "double" gas that Mr. Tully proposes to supply, to have anything but uniform conditions, as, with a gas of 380 B.Th.U. per cubic foot, there is not much room for composition, thermal, and density variations in the gas for ordinary household purposes, without courting disaster in relation to those whose custom it is desired to obtain and to maintain.

The object of the communication is to show the possibilities in the shape of economy to small works and to their customers of adopting "double" gas of 380 B.Th.U. in lieu of coal gas of (say) 550 B.Th.U. *Primâ facie*, the case presented by Mr. Tully is attractive for small works producing gas at a heavy cost, and with business curtailed in its development owing to the high price that has to be charged. Mr. Tully is out to show the managers of these works how to give to the consumers a larger number of B.Th.U. for their money than they can obtain with ordinary coal gas. But as things stand at present, there are two or three primary objections to the supply of gas for general use having only a calorific value of 380 B.Th.U. The first one is that Parliament is not prepared at the present time to consider the supply of gas of such low calorific power. In the second place, the gas appliances on the market are designed for gas of a calorific value of round about 500 to (say) 550 B.Th.U. gross. In the third place, a gas of such low calorific power—unless, of course, it came into general use, which is not likely—assails the achievement of the hope that the provision of gas of fairly uniform calorific power and specific gravity may lead to such standardization of gas-consuming appliances that there will be a cheapening, and a lessened call for attention to the air adjustment. A considerably larger quantity of gas of 380 B.Th.U. value would have to be consumed than is the case with a gas of 550 B.Th.U. Perhaps a minor objection to the complete gasification system is the almost entire absence of residual products—there being only a small quantity of tar and ammonia realized. It is no doubt an excellent thing to diminish the quantity of coke placed upon the market; but it is not an excellent thing to altogether denude a district of coke. In the case of a district depending on a "double" gas plant, if coke were required, it would have to be imported, and then the price would necessarily have to be higher to the local consumers than would be the home-produced article. Any large adoption of the double-gas process (which we do not think Mr. Tully anticipates) would also be a further encouragement to the coke-oven and low-temperature processes, and tend to swell the volume of competition in the secondary products markets. These are objections, and there are still others; while Mr. Tully tells us the "only" objection that can be raised to the use of the double gas is its higher toxicity, owing to the higher percentage of carbon monoxide it contains than coal gas. This is a material objection, which need not be further discussed. Furthermore, the gas contains a higher percentage of inert gases than ordinary coal gas; and this naturally has a very detrimental effect on flame temperature, owing to the quantity of heat that is carried away by the larger volume of combustion products. It cannot be said we are so far particularly smitten with the scheme for the entire displacement of coal gas by "double" gas.

Then we come to value for expenditure. Mr. Tully shows that the consumers would get a considerably greater advantage from the "double" gas of 380 B.Th.U. than from coal gas of 550 B.Th.U.—that is to say, the consumers patronizing a very small works, and paying a high

price for coal gas. Mr. Tully puts the charge to the consumer for the 380 B.Th.U. gas at 2s. 6d., and of the 550 B.Th.U. gas at 5s. 9d. (not 6s. 3d. as mentioned in the paper). At these prices, the consumer gets respectively 12,668 B.Th.U. and 8730 B.Th.U. for a penny. But these B.Th.U. figures do not actually show the difference in value to the consumers, in view of the lessened heat waste by the combustion of the gas containing the lower percentage of inert constituents. In these days, too, we have to go by comparisons; and we know there are small works that are supplying coal gas at less than 5s. 9d. per 1000 cubic feet; and wherever a consumer, no matter by what size works he is supplied, can get 550 B.Th.U. gas at 3s. 7d. per 1000 cubic feet (total 550,000 B.Th.U.), he will be doing better than with 380 B.Th.U. gas at 2s. 6d. per 1000 cubic feet (total 380,000 B.Th.U.). From the former he would get 12,791 B.Th.U. for a penny; from the latter 12,668 B.Th.U. The former gas possesses the greatest all-round value, including the higher flame temperature for a consumption of gas equivalent in B.Th.U. The 3s. 7d. straightway shows that "double" gas, as its virtues have so far been put before us, has a very limited field. Unless the coal gas is at a price (say) above 4s., providing, too, the consuming appliances are fitted for such a low calorific power gas, there would not be any advantage in the suggested change from the consumers' point of view, although if the price were at the high one taken in the communication, there would be something in the proposal from the point of view of cost saving (which Mr. Tully puts at 45 per cent.), less any disadvantages accompanying the use of the lower calorific value gas. From the small gas suppliers' point of view, Mr. Tully shows that they would sell double the quantity of the lower power gas at the lower price, and would, if things worked out according to computation, make an additional profit of £42 a year. There is no information in the communication to show whether or not this £42 would be more than swallowed up in the capital, maintenance, and depreciation charges of the new plant, and whether, in addition, it would provide the necessary amortization for the discarded coal-gas plant.

We are not making these points in any hypercritical spirit; but in order to give Mr. Tully an opportunity of discussing the matter more fully, and clearing the ground of first objections. He is perfectly at liberty to trample on the points as heavily as he pleases, as if there is a real economic place for the "double" gas, then we shall be as anxious as anyone else to see it take its rightful position. The final words in Mr. Tully's communication are noted with much interest: "Arrangements are now being made to fit up some small "gas-works for supplying 'double' gas independently for "general purposes, which will be a pioneer movement of "importance to the gas industry, and more especially to "small struggling gas undertakings." We shall be glad to watch the development of this movement, and will do our part in advancing it if practical experience proves the firmly anticipated importance.

Arc Lamp Carbons and Street Lighting.

"Electrical Engineering" appears to think that the British gas industry is, owing to the war, in a worse fix in regard to its mantles than the electrical industry is in respecting its arc-lamp carbons. We should have been in worse case, but——. For the explanation, read up the last two issues of the "JOURNAL." Our contemporary also asserts that it will probably be even more difficult to procure gas mantles for high-power units than it is to obtain arc lamp carbons. The limit of the knowledge on the subject of the writer of this statement is shown by the fact that a considerable number of the high-pressure mantles used in this country are made at the works of the British makers. As to arc lamp carbons, there is only one works here, those of the General Electric Company, where they are produced. But nine-tenths of the carbons consumed in this country are imported from Germany, Austria, and in small part from France. The General Electric Company's carbon works have, by producing carbons, also produced a considerable loss. Small works in Switzerland and Spain are only just about equal to the native requirements; while the output of a factory in the United States has to be supplemented by consignments of carbons from Germany. External aid for this country is therefore hopeless. The General Electric Company's works are running at full speed now; but the demand on them is about ten times more than they can supply. To prevent people sending orders for carbons beyond their requirements, and hoarding-up a stock, the Company have put a high price on their productions. The Board of Trade have taken measures to urge electric-supply authorities to economize their carbons, and to replace arc lamps by other means of lighting, wherever possible.

Contracts and German Firms.

The question has been freely asked among gas men as to the legal position, in view of the war, of the Tottenham District Light, Heat, and Power Company in regard to their German gas-holder contract. The electrical industry is largely interested just now in the subject of contracts with Germany; and a legal inquiry has been made into the matter on behalf of the "Electrical Times." A few passages may be extracted from the opening of the article on the subject: Generally speaking, it may be said that an executory contract signed with a German or Austrian firm before the war is voidable, and a contract signed during the war is, of course, void in any case. Chitty says that: "If there were a contract with an alien, and, *whilst it was merely executory*, war broke out between this country and that of the alien, this would dissolve the contract." It is important to note, however, that according to Chitty "where there was a contract with an alien, and a cause of action accrued to him before the actual declaration of war, the right to sue thereon is only in abeyance and revives upon the restoration of peace." Again, "Addison's Law of Contracts" sets out that all contracts for trading purposes made during the war between British subjects and the subjects of a sovereign who is at war with this country are void, and cannot be enforced in our Courts of Law on the return of peace. It is suggested that contractors with German firms would be well advised to study closely the conditions of their contracts. The question of whether the materials are *en route* is also one for consideration. If they are still at the contractor's works abroad, the contract may be ignored "But, in case an action may be brought against the British purchaser after the resumption of peace, the purchaser should be in the position to prove that the war rendered it necessary for him to place the contract elsewhere."

The Patent Office and the War.

The Official Journal of the Patent Office furnishes evidence of the falling off of business, so far as the number of applications for patents is concerned; and the last issue also contained another sign of the struggle going on, in the shape of several notices in terms of the Patents, Designs, and Trade Marks (Temporary Rules) Act, 1914. Under these rules, the Board of Trade may, on the application of any person, and subject to such terms and conditions as they may think fit, "order the avoidance or suspension, in whole or in part, of any patent or licence granted to a subject of any State at war with His Majesty," or the registration of any trade mark the proprietor of which falls under the same designation. The fees payable in either case are stated in the notices; and the mode of procedure is set forth—forms also being provided for the use of persons who are desirous of proceeding under the Act. For the benefit of those who may contemplate taking action, it should be mentioned that the Board, before granting any such application, may require to be satisfied on the following heads: (1) That the patentee or licensee is the subject of a State at war with His Majesty. (2) That the person applying intends to manufacture, or cause to be manufactured, the patented article, or to carry on, or cause to be carried on, the patented process. (3) That it is in the general interests of the country or of a section of the community, or of a trade, that such article should be manufactured or such process carried on as aforesaid. The stipulations in regard to trade marks are of a similar character. Further, it is announced that during the continuance of the war, or until further notice, no patent will be sealed, and no registration of a trade mark or design will be granted to subjects of any State at war with His Majesty; and these will be taken to include (*a*) a firm which by reason of its constitution may be considered as managed or controlled by such subjects, or the business whereof is wholly or mainly carried on on behalf of such subjects, (*b*) a company which has received its constitution in an enemy's State, and (*c*) a company registered in His Majesty's dominions the business whereof is managed or controlled by such subjects, or is carried on wholly or mainly on behalf of such subjects.

PERSONAL.

There is very little improvement in the condition of Mr. ADAM COOKE, the Manager of the Oldbury Gas-Works, which still continues critical.

On the occasion of his departure for the front as a Territorial officer, Mr. G. R. ANDERSON, the Manager of the Tipperary Gas-Works, was presented by the employees with a valuable gold sovereign purse.

At a meeting of the Leeds Gas Committee on the 25th ult., Mr. HAROLD H. COLLETT, of Sunderland, was appointed Manager of their Meadow Lane Gas-Works. Mr. Collett served an apprenticeship with Messrs. Kendall and Gent, Machine Tool Makers, Manchester, and was afterwards for five years with the Whessoe Foundry Company, Limited, of Darlington. In 1906, Mr. Collett was appointed Chief Draughtsman to Mr. Charles Dru Drury, the Engineer of the Sunderland Gas Company, and under his supervision was responsible for the drawings, specifications, bills of quantities, and other work in connection with the reconstruction of the Ayre's Quay works. In 1909, Mr. Collett was appointed Manager at Ayre's Quay, and has since had charge of the first installation of Dessau vertical retorts erected in the United Kingdom. Mr. Collett is to take up his new duties at Leeds about the middle of this month.

THE GAS INDUSTRY AND THE WAR.

An American engineer, whose occasional contributions to the "JOURNAL" pages are always welcomed, writes from Philadelphia, under date of Aug. 14: "I am sending these few lines to assure you—what you probably know already—that public opinion in this country is almost entirely anti-German in the present war; believing that the conflict could have been avoided if Germany had said the word. Of course, your gas-works, like all other British industries, will suffer from the effects of the war. In this fortunate land, outside of a certain amount of price-raising in articles of food, and the prospect of new taxes to make up for any deficit in import revenues, the war seems likely to affect us only as some horrid dream that we can hardly believe we are experiencing."

A notice has been received by the Secretary of the Institution of Gas Engineers (Mr. Walter T. Dunn) from the Department of Technology of the City and Guilds of London Institute, stating that students of technological classes and others preparing for any of the examinations of the Institute's Department of Technology will not, so far as possible, be prejudiced in competitions for certificates and prizes, if they have been prevented from fulfilling the Institute's regulations as to attendance at classes or otherwise, by reason of their having joined the Military Forces of the Crown or having accepted temporary civil employment in connection with the defence of the country. The notice has been sent in view of any questions that may arise in regard to the new examinations in the subject of gas-fitting.

It is interesting to note the terms of an "Important Notice" which the South Metropolitan Gas Company have had posted up at their various stations. Dated the 19th ult., it is as follows: From and after this date no appointments to, or engagements on, the Company's permanent or regular staff will be made until the close of the war. When peace is declared, applicants for such positions will be required to produce satisfactory evidence of what they have done for their country in her hour of need.

The Davis Gas-Stove Company inform us that the Army and Navy have claimed about 200 men from their Luton works; while 92 of the Luton staff have joined the ranks of the local Territorials. The Directors are anxious to do everything possible for those who have left to fight for their country. Their positions will be kept open for them; and every assistance will be given to their dependants. The Company have always taken a great interest in the Territorial movement; and it is largely due to the energy of Mr. Harold N. Davis that the Luton Battalion is as strong and efficient as it is. Employees of the Davis Gas-Stove Company have received every encouragement to join the ranks; and the response is something of which they may be justly proud. A large number of troops are now stationed at Luton; and about 60 soldiers are billeted in the institute and gymnasium which the Company have built for their employees. A great effort is being made to fill the places of those who have left for active service, as the Company take an optimistic view of the situation. There is no thought of closing their works, or of putting the men on half-time. On the other hand, they consider themselves justified in expecting a large demand for the output of their works during the season, and are making all arrangements to deal with it.

Under the heading "The War and the Gas Industry," in the Engineering Supplement of "The Times" last Friday, an Engineering Correspondent said: "In spite of the cloud of uncertainty which surrounds the future, the situation up to now has provided at least one bright spot for the gas engineer. The temporary stoppage of coal supplies and the present reduced shipments have placed many of the smaller industrial concerns, with no facilities for storing fuel, in a decidedly critical position. The result has been that the capabilities of coke for meeting the occasion have been swiftly realized; and it seems probable that not only will considerable inroads be made into the present immense stocks, but that a substantial increase in average value will result. Coke, moreover, is not the only bye-product which should appreciate; for, with the crippling of German commerce, the distribution of immense quantities of sulphate of ammonia from that country will be checked, with a corresponding increase in the price of the limited supplies in this country. In addition, the menace of the German methods of synthetic production of sulphate of ammonia will lose a good deal of its force."

Mr. F. A. Price, the Superintendent of the Manchester Gas Department, writes that at a special meeting of the Corporation Gas Committee, held last Friday, it was moved by the Chairman (Mr. Councillor Kay, J.P.), seconded by Alderman Ashton, and adopted unanimously: "That, subject to the approval of the Council, and with a view of supplementing the worthy efforts of the citizens of Manchester, the sum of £7000 be paid out of the reserve fund of this department towards the equipment of a Manchester Battalion; and also £3000 from the same source as a contribution to the Lord Mayor's Local Relief Fund." The resolution was communicated to the employers of labour who were deliberating on the prospects of raising and equipping the Manchester battalion; and they were delighted with the decision. Members of the Council when spoken to on the subject expressed the hope that the example will be followed by other departments of the Corporation who have the means at their disposal, and by some of the joint-stock companies.

Further subscriptions to the Relief Fund have been noted, as follows: South Yorkshire Coal Owners' Association, £20,000; Lochgelly Iron and Coal Company, Limited, £1000; Brimsdown Lamp Works, Limited, £500; A. E. Brotherton, £500; Portsea Island Gaslight Company, £250; Voelker Lighting Corporation, Limited, £250; Barnet Gas and Water Company, £210; Aldershot Gas, Water, and District Lighting Company, £105; Sutton (Surrey) Gas Company, £100; Ryde Gas Company, £52 10s.; Weston-super-Mare Gas Company, £10 10s.

At the meeting of the Eastbourne Gas Company, it was agreed that 75 guineas should be contributed to the National Relief Fund and 25 guineas to the Eastbourne Emergency Fund. The announcement was also made by the Chairman that the wives and families of such of the Company's employees as had gone to the front would be taken care of in the latter's absence. The Harrogate Gas Company contribute £25 to the National Fund, and a like sum to the local fund.

The Directors of the Brentwood (Essex) Gas Company have decided to make up the difference between the Government allowance and the full wages to all employees who have been called to the Colours; also to keep their places open for them.

To the wives and families of those of their employees who have been called up on active service the Herne Bay Gas and Electricity Company are granting half-wages during the period of hostilities.

At the meeting of the Barnsley Gas Company last Thursday, it was decided to allow 10s. per week to the dependants of any of their employees who might be required for active service; and to contribute 100 guineas to the Barnsley Patriotic Fund.

The Arbroath Town Council have decided to, in the meantime, continue paying such of their employees as have gone to the front their full wages, less 1s. per day; the wages to be paid over weekly to their wives, or to such other persons as they may indicate. The situations of these men are to be kept open for them.

At a meeting of the employees of the Heckmondwike and Liversedge Gas Company last week, it was unanimously agreed to allow a 2½ per cent. deduction each week from wages as contributions to the local War Relief Fund. The deduction is to work alternately at Heckmondwike and Liversedge, so that employees will only subscribe once a fortnight. Mr. F. D. Richmond, the Manager, has offered to add 3d. from his own pocket for every shilling which is subscribed.

Messrs. Mobberley and Perry, Limited, of Stourbridge, are giving substantial weekly assistance to the families of their employees who have gone to the war during their service in the interest of the country, and have arranged for their positions to be kept open for them on their return.

In the course of their monthly circular on the Manchester chemical trade, dated Aug. 28, Messrs. Sir S. W. Royse and Co., Limited, say: There have been some heavy advances in values, sometimes from day to day; but matters appear now to be settling down somewhat. In tar products, crude carbolic acid has quickly been affected by the war, advancing heavily in price; but latterly there is some little easing, perhaps caused by the prohibition of export bringing on the home market some quantities that were intended for abroad. Crystal carbolic has been active, and liquid carbolic is much dearer. Solvent naphtha remains steady, but

has little inquiry. Benzols had a panic advance early in the month; but with petrol remaining unchanged, the position is now becoming normal. Creosote is steady, but may be affected by increasing stocks consequent upon the stoppage of exports. Pitch is quiet. The Continent will now require less; but that should cause an increased consumption in this country. Sulphate of ammonia business is difficult, under present conditions caused by the war. Production is below normal, but an increase in stocks appears probable; and altogether the outlook is not bright.

Mr. William H. Taylor, of Manchester (author of the "Inventors' and Patentees' Year Book"), heard from his Paris agent on the 19th ult. that, by a decree dated Aug. 16, the French Government will allow applications for patents to be made without payment of the usual application fee of 100 frs. Such payment is only to be made after the war, and on a date to be subsequently fixed. The decree applies to British applicants and (presumably) to all others except subjects of countries at war with France.

A Birmingham gas consumer having complained that a collector had declined to take paper money, inquiry was made at the headquarters of the Gas Department. The fact was then elicited that no instructions of the kind mentioned had been issued. On the contrary, the department are receiving between £300 and £400 a day in £1 notes. It was pointed out that the collectors are in the habit of changing into gold the coppers they take from automatic meters at the shops of tradesmen in the district, so as to lighten their load; and it is thought that the refusal alluded to arose out of a misapprehension in the collector's mind.

Touching the experiences in Germany of Mr. Ernest Hutchence as related in the "JOURNAL" last week (p. 443), and his reference to the kindness shown him while a prisoner, it is of interest to notice that the military governor of Elberfeld looked with severe eye on such little attentions to prisoners. That worthy has issued the following order, which has been posted at the railway station: "German women and girls in many cases have behaved themselves unworthily during the passage of prisoners of war. The station-masters are hereby ordered to put a stop to this in the sharpest manner, for our national honour is tarnished by such behaviour." Mr. Hutchence thought, and thought properly, that the national honour was brightened instead of tarnished by the attentions shown him.

Messrs. Brotherton and Company, Limited, of Leeds, write: "We feel sure your readers will be interested to know that Mr. Edward Allen Brotherton, the Lord Mayor of Leeds, and Chairman of this Company, has promised a contribution of £5000 to the Leeds subscription list of the Prince of Wales's National Relief Fund."

In giving an account of interviews with British wounded on their return from the front after the battle at Mons, Mr. H. Hamilton Fyfe, the Special Correspondent of the "Daily Mail," says: Opinions differed about the German gunners' accuracy. This is explained by the obvious fact that some batteries have their fire better directed than others. "One thing they could not do," another man of the Berkshires told me. "They could not hit the gas-works at Mons. If they had, I would not be here. We were close to the works, and we could see they were trying and trying to land a shell on the big gasholder. Every time they missed, we cheered. But I tell you we waited for the next shot pretty anxiously. This side and that side they went, too short or too far. They could not get it fair."

NITRATE OF THORIUM.

From the Voelker Lighting Corporation, Limited, through their Chairman, Thomas D. Asten.

WITH regard to the article on this subject in your last issue, may we be permitted to answer some of the criticisms which your visitor offers [*ante*, p. 445] as to our statement of the monazite sand position.

(1) The Brazilian sand held by Gordon and De Freitas is of little importance either in extent or richness, when compared with the deposits in Travancore, which, *and this is no expression of opinion*, now dominates the mantle situation.

(2) The "independent" manufacturers of thorium nitrate—Sthamer, De Haen, Kuhmhein, and Knoeffler—have in England but *one agent*, who, on the 1st of January in each year, sends to his customers a note of the price fixed by the German Convention of Thorium Nitrate for the ensuing year; and, in selling the nitrate, he will not guarantee to supply to any customer any particular make. This is a curious example of "healthy competition." The Austrian Welsbach Company has been this three years in the pocket of the Auer Company.

(3) As regards the supply being regulated. In January last the Auer Company threatened, and they knew they had the support of the "independent" manufacturers, that unless the mantle companies agreed to the terms of the proposed combine, they would no longer receive a supply of thorium nitrate; and, if they did agree, they were to receive only such nitrate in any year as they had used during the previous year. The only really independent supply of sand is Carolina sand belonging to the South Metropolitan Gas Company—some hundred or so tons of which are still lying in London.

We quite agree with your visitor as to the responsibility for the present situation being at the door of those who have bought mantles simply on price, regardless of the source, and in many cases to the exclusion of the anti-trust houses, who, as we previously pointed out, are depending for their profits on mantles, and receiving no help from the sale of electric metallic filament lamps, must naturally, in order to be able to live, ask a slightly higher price for mantles than the Trust.

What we hope to see is the formation of some English combination of manufacturers which, with the help of the gas industry, will be able to handle this contract for monazite sand to the exclusion of the Germans.

BRITISH COMMERCIAL GAS ASSOCIATION.

Proposed Adjournment of the Annual Conference—Formal Meeting to Consider Annual Report and Accounts only.

VERY wisely, the Executive Committee of the British Commercial Gas Association have decided upon a course of action, in regard to the annual conference, which, we think, must commend itself to the General Committee and to the Association membership throughout. The following letter which was posted yesterday to those concerned explains the proposals:

47, *Victoria Street*,
Westminster, S.W.,
Aug. 31, 1914.

Dear Sir,—In view of the abnormal conditions now prevailing in this country, and likely to prevail for some considerable time, the Executive Committee have decided to recommend to the General Committee the following course of action:

(1) To proceed with the full publicity campaign during the ensuing year, so as to assist the industry as far as possible to carry on its "business as usual;" the copy used to be made specially applicable to the exceptional condition of both industrial and domestic economics.

(2) To hold no annual conference this year; the visit to Glasgow being postponed until October, 1915.

(3) To hold, as a matter of form under the rules, an annual general meeting at Caxton Hall, Westminster, at 3 p.m. on Tuesday, the 27th October, to receive the annual report and statement of accounts.

(4) To postpone until October, 1915, the retirement of the President, Bailie Thomas Paxton, who, under the present exceptional circumstances, has consented (contrary to his personal convenience) to serve for another year.

(5) To postpone until October, 1915, the retirement from office of those members of the General Committee who would in the ordinary course have retired in October, 1914, and have then been eligible for re-election.

It is felt by the Executive that it will be impossible to obtain a representative attendance of members at the necessary annual general meeting at the present time, and that it is therefore desirable to allow all matters upon which members might be called upon to vote to remain as they are until a more favourable season.

These proposals will be laid before the General Committee on the 15th prox., and, if then approved, will be formally submitted for ratification to the general meeting on the 27th of October.

Unless the Secretary hears from you to the contrary before the 15th of September, the Executive will assume that their recommendations are approved.

If there are any matters concerning the development of the sales of gas and coke upon which members feel that official representations by the Association to the authorities could usefully be taken at the present juncture, will they please communicate with the Secretary.

The position in regard to the supply of mantles and glassware is receiving careful consideration.

Yours faithfully,

(Signed) F. W. GOODENOUGH,
Chairman of the Executive.

Eastern Counties Gas Managers' Association.—An intimation has been sent out to the members by the Hon. Secretary and Treasurer (Mr. Joseph Davis, of Gravesend) to the effect that, in consequence of the present deplorable crisis, it has been thought advisable by the President, Vice-President, and Committee to postpone the autumn meeting this year, and probably abandon it altogether. It is felt that, if the meeting were held, the attendance would probably be very small, inasmuch as all members are likely to need to give close attention to their individual works.

ELECTRICITY SUPPLY MEMORANDA.

We are all, excepting a very few, good patriots; and the "few," if at the present time judgment upon them went by a majority vote of their fellow countrymen, would find that they were condemned to a rapid translation to another sphere. But the more we, the patriots, read the newspapers, the more are we faced by the fact (which chastens us, and causes us to resolve that we will mend our ways henceforth) that we have all, each in his part, done much to enrich the very countries—we might say, *the* country—with which this nation is at war. But when we reflect, it is borne upon us that the same papers overlook the export business which we have been doing with these countries. At the same time, there is little reason why industrially we should not in future do without them as much as possible, nor why we should not, while they are debarred from foreign trading, do all possible in securing for this country a good share of the business which the commercial acumen of the German nation has gained. The gas industry has never, other than in lighting goods, been large patrons of Germany—that is to say, not for heavy goods. But the British electrical industry, and many well-known electrical engineers, have taken what appears to have been a wicked delight in sending their contracts across the North Sea, and having on the generating and other plant plates bearing names which the rank and file at the generating-stations look upon as enigmatical, and as signifying something that must have been bred and born in the barbarous ages, before people had christianlike names bestowed upon them. In the lighter electrical goods, too, the electrical engineers of Great Britain have been very busy in helping to build up the wealth of Germany. Some enlightening statistics on the subject of Germany's electrical export trade have been published by "Electrical Engineering." These show that the exports of electrical machinery and apparatus from Germany to all countries in 1913 were of the total value of £14,500,000. This is a goodly sum. It includes everything from large machinery to small electric appliances and parts, and onwards to carbon filament lamps, arc lamp carbons, and fuses. Contracts for all sorts of things were running at the beginning of hostilities. Of arc lamps and mercury vapour lamps, 595 tons were exported by Germany during last year, of the value of £143,000. Great Britain took 74 tons. Of arc lamp carbons, the total weight exported was £7051 tons, of the value of £491,300. Great Britain took 1740 tons. Of metallic filament lamps, the total weight exported was 2114 tons, of the value of £2,251,900; the aggregate number of lamps being 48,264,231. Great Britain took 148 tons. Of carbon filament and Nernst lamps, 242 tons were exported, of the value of £167,650; the number of lamps being 7,916,003. Great Britain took 45 tons.

Patriots and Patrons.

Lamps and Commercial Fortifications.

In view of these figures, it is thought that the lampmakers at home have a fine chance of securing additional manufacturing business not only in fully supplying the home market, but in working for the overseas markets. But among the methods of Germany has been that of not merely building-up a big business in other countries, but of making itself apparently indispensable in some respect in connection with the manufactures that those other countries take up in competition. Our manufacturers have not learned the art of making Germany feel that we are indispensable to it in like manner. Our manufacturers, however, have now had the scales removed from their eyes. In connection with the gas industry, there will no doubt be an attempt to make the country independent of Germany in the matter of the nitrate of thorium required for incandescent mantle manufacture, and in the electrical industry of lamp bulbs and the material for metallic filaments. In the electric-lamp line there is talk of British manufacturers cutting slices out of Germany's export business while the war lasts; but how is it to be done, when the manufacturers have been so largely dependent upon Germany for ingredients and parts? Now that there is an opportunity for them, they always come up against a barrier—Germany or its ally Austria. While several parts of the lamps could be promptly made in this country, materials are wanted from Germany or Austria for other parts. Some of the manufacturing electrical concerns in this country, it is also alleged, have been largely financed by German capital. However, to statistics, as also presented by "Electrical Engineering." It has been calculated that about 12 million metallic filament lamps and about 8 million carbon filament lamps are sold annually in this country. Of these totals about 3½ million metallic filament lamps and about 1½ million carbon filament ones were imported from Germany. It is thought that there may be a considerable drop in the demand for these lamps during the war, as dealers are nervous about buying stocks; but there is the hope that, by the end of the year, the consumption will be practically normal. This is questionable, in view of the fact that theatres are closing, and shops are keeping open less hours in the evening, owing to shortness of business in these days when economy with some people has become an imperative necessity. It is not likely, therefore, that the part of the 5 million electric-lamps usually imported to this country from Germany over the period that will be defined by the continuance of the war will all be required; and, as to the exports to other countries hitherto enjoyed by Germany, it is doubtful whether makers at home will be able to do much during the course of the war in capturing any part of the trade. There are fifteen factories in this country engaged in incandescent electric lamp manufacture—some are large; the majority quite small. But what of the supply of the materials for the filaments; and what of the bulbs for the lamps? There are only two of the works that blow their own bulbs—the rest of the bulbs required by our manufacturers come—from where? Germany! These facts do not make the outlook hopeful for an extension of the electric lamp export trade of this country. Industrial Germany has been clever in the construction of commercial fortifications. Many of our manufacturers have something yet to learn of the ways and means of industrial and commercial expansion and protection—protection in other ways than those afforded by tariffs.

Others' Views.

We have confirmation of these views in some remarks that have been published in the "Commercial Supplement" of the "Electrician." Just recently we called attention in the "Memoranda" to the fact that it was easier to talk of the capture of Germany's export trade in certain directions than to effect the capture, owing to various causes, which may be summed up as the unpreparedness of our factories, finance, skilled labour, and the indolent reclining of this country upon Germany for the supply of the manufactured materials required for the completion of goods. The funny man whom the "Electrician" keeps on its staff (for what purpose it is difficult to ascertain, unless the paper in question has a number of readers who are extraordinarily weak-brained), after our comments appeared, referred to the writer of the "Memoranda" as a friend of the Kaiser. Now read this from the columns of the same paper, and note how every line confirms our views:

> During a remarkably short period, the industrial products of a methodical people have captured the markets of the world at prices which have compelled the prospective customer to buy. But the price has not been all. The system of manufacture has made the quality right too; and, with both factors in his favour, the manufacturer has not feared the result of his trading. The German has made himself a specialist in many of the raw and semi-raw materials upon the supply of which the electrical manufacturer, in practically every country, completely depended for the completion of his output. . . . It will be observed, from our correspondence columns this week, that at least one English manufacturer has appealed to the home suppliers of certain classes of raw material to adopt the methods of the German houses. They point out that the indigenous product is not equal to that obtainable abroad, and, quite aside from patriotic reasons, they felt compelled, for the sake of maintaining the quality of their own goods, to purchase out of the country. The German had, previous to the war, slowly (it may even seem laboriously) achieved his object in making the buyer in foreign countries come to him for much of the material and parts which he needed for his daily production. It had become a matter of compulsion, because the German beat all his competitors, both home and foreign, with the quality and the price. When these factors in any deal are right, the transaction is usually concluded. . . . Because Germany has been a great rival and a fellow aspirant to imperial, commercial, and industrial honours, she is not to be despised. . . . Her achievements in the sciences and arts are undisputed, and are worthy of emulation.

If the electric-lamp manufacturers could get hold of the materials, if finances were right, if skilled labour were available, if the manufacturers were given the assurance that they would receive full patronage after the war, so that they could with confidence raise the productive capacity of their works to the requisite level, there is no reason whatever why they should not equal, if they could not beat, the German productions. Germany had to make a start in these things; and who says that their efficiency to-day cannot be matched in our own country? In this country, we have manufactures which experts in Germany admit excel their own. May we instance gas-fires and decorative gas-fittings.

Early to Bed.

In the opening paragraph of the "Memoranda" last week, allusion was made to the restriction of electricity business through the closing of places of entertainment and the early drawing of the shutters of shops. In Paris, under martial law, all cafés close at eight, not a flash-light advertisement is to be seen at that time, and not a theatre is open, and at half-past nine all the restaurants are shut up. Paris is not Paris then. The only outdoor lights are the searchlights of the Place de la Concorde, which diligently scour the sky for air-ships. We have not yet arrived at that condition in London. When we do—if ever—there will be a still further lessened demand for the means of artificial light. In some districts of this country, the licensed houses are now closed earlier than usual. In Harrow and the neighbourhood, the licensed houses have received orders from the police to close at nine o'clock, instead of eleven, until further notice. This will affect the consumption of gas and electricity in a minor degree; and, though we do not suppose this is the object, it will also assist in preventing the useless expenditure by the poor of money that may later on be urgently needed for food.

The "Half-Watt" Lamp.

The "Electrician" has, probably for the lack of something better to talk about just now, been raking over the subject of the "half-watt" lamp; and in an editorial has given an indication of the contents of one of the now ancient

papers which introduced to our notice the troubles that had been encountered in the development of the lamp. The "Electrician" admits that, even now, it is probably too soon to pronounce anything like a final verdict on the performance of the lamp; and it also agrees with what we have been saying for long past, that "lamps of this type are not likely to compete, for the present at any rate, with the older type to any very great extent in so far as domestic lighting is concerned." The extraordinary piece of intelligence is also given to the electrical industry that the lamp "is sold under a number of different trade names, with the added description that they take half-a-watt per candle power," which some people who are not particular as to the form of the expressions they use would call, particularly in regard to the lower candle powers, a "bare-faced lie." A short time ago we were interested in an investigation that had been made by Dr. H. Lux into the thermal efficiency of these lamps in comparison with the ordinary tungsten filament lamp. A longer account of the investigation than we previously saw has appeared on the page of our contemporary preceding that on which the editorial article appeared, and there the writer of the article might have seen how false the lamps are to their nominal title. A "Nitra" lamp of (our contemporary calls it) 1000-candle power (we prefer to say 1000 Hefner units) was used, and an ordinary Osram of 200 Hefner units, on 110 volts. At that voltage the watts taken by the 1000 Hefner unit lamp was 524·7. Tested photometrically the horizontal Hefner unit power was 1080; spherical, 926·2; hemispherical, 985. The efficiency was 1 spherical Hefner unit per 0·567 watt, and 1 hemispherical Hefner unit per 0·533 watt. The absolute temperature was 2850° C. If about 10 per cent. is knocked off the Hefner units to find the candle power, it will be seen that the efficiency is worse than is stated. But when we come to the so-called ordinary 200-"candle power" Osram lamp, we find that this, on 110 volts, took 257·38 watts; and the horizontal Hefner units were 256, and the spherical 202·1 (less about 10 per cent. to arrive at the candle power). The watts per spherical Hefner unit were 1·171. The absolute temperature was 2450° C. It is a pity that Dr. Lux did not carry his investigation to the lower units of the so-called "half-watt" lamps, because we think his eyes would have been opened to the falsity of description, especially after the lamps had been running for a time, and physical changes in, and volatilization of, the filaments had taken place. We are surprised that our electrical contemporaries—our *technical* electrical contemporaries—aid and abet the manufacturers in their false descriptions. It has been said that the tungsten lamp is not so susceptible, in respect of lighting power, to fluctuations of voltage as the carbon filament lamp. Compare these two lines of figures from Dr. Lux's tables:

	1000 H.U. Lamp. Hefner Units.			200 H.U. Lamp. Hefner Units.	
Voltage.	Horizontal.	Spherical.	Hemispherical.	Horizontal.	Spherical.
110 . .	1080 ..	926 ..	985 ..	256 ..	202
100 . .	801 ..	686 ..	730 ..	176 ..	139

The thermal losses of the lamps are discussed by Dr. Lux. There are the convection losses due to the nitrogen being in contact with the filament; and there is also a loss through the filament being in the form of a spiral. The limit to the development of the metal filament lamp is set by the melting-point of tungsten, which is about 3200° in absolute temperature.

REVIEW OF THE PROGRESS OF CHEMISTRY.

The President of the Chemical Section of the British Association—Professor William J. Pope, LL.D., F.R.S.—opened his address with a review of the progress of chemistry. In his introductory remarks, he pointed out that the investigator, continually occupied with his own problems, and faced with an ever-increasing mass of technical literature, ordinarily finds little time for reflection upon the real meaning of his work, and secures, in general, far too few opportunities of considering in a philosophical sort of way the past, present, and future of his own particular branch of scientific activity. He then proceeded as follows.

It is not difficult to form a fairly accurate survey of the position to which chemistry had attained a generation—perhaps even a few years—ago. Probably no intellect now existing could pronounce judgment upon the present position of our science in terms which would commend themselves to the historian of the Twenty-first Century. Doubtless even one equipped with a complete knowledge of all that has been achieved, standing on the very frontier of scientific advance and peering into the surrounding darkness, would be quite incompetent to make any adequate forecast of the conquests which will be made by chemical and physical science during the next fifty years. At the same time, chemical history tells us that progress is the result, in large measure, of imperfect attempts to appreciate the present and to forecast the future. I therefore propose to lay before you a sketch of the present position of certain branches of chemical knowledge, and to discuss the directions in which progress is to be sought. None of us dare cherish the conviction that his views on such matters are correct; but everyone desirous of contributing towards the development of his science must attempt an appreciation of this kind. The importance to the worker and to the subject of free ventilation and discussion of the point of view taken by the individual can scarcely be over-estimated.

The two sciences of chemistry and physics were at one time included as parts of the larger subject entitled "Natural Philosophy;" but in the early part of the Nineteenth Century they drew apart. Under the stimulus of Dalton's atomic theory, chemistry developed into a study of the interior of the molecule, and, as a result of the complication of the observed phenomena, progressed from stage to stage as a closely reasoned mass of observed facts and logical conclusions. Physics, less entangled in its infancy with numbers of experimental data which apparently did not admit of quantitative correlation, was developed largely as a branch of applied mathematics. Such achievements of the formal physics of the last century as the mathematical theory of light and the kinetic theory of gases are monuments to the powers of the human intellect.

The path of chemistry, as an application of pure logical argument to the interpretation of complex masses of observations, thus gradually diverged from that taken by physics as the mathematical treatment of less involved experimental data, though both subjects derived their impetus to development from the speculations of genius. It is interesting to note, however, that during recent years the two sciences which were so sharply distinguished twenty years ago as to lead to mutual misunderstandings, are now converging. Many purely chemical questions have received such full quantitative study that the results are susceptible to attack by the methods of the mathematical physicist; while, on the other hand, the intense complication perceived during the fuller examination of many physical problems has led to their interpretation by the logical argument of the chemist, because the traditional mathematical mode of attack of the physicist has proved powerless to deal with the intricacies exhibited by observed facts.

The progress of chemistry during the last century has been mainly the result of the co-ordination of observed facts in accordance with a series of hypotheses each closely related in point of time to the one preceding it. The atomic theory, as enunciated by Dalton in 1803, was a great impetus to chemical investigation, but proved insufficient to embrace all the known facts. It was supplemented in 1813 by Avogadro's theorem—that equal volumes of gases contain the same numbers of molecules at the same temperature and pressure. These two important theoretical developments led to the association of a definite physical meaning with the idea of molecular composition, but ultimately proved insufficient for the interpretation of the ever-increasing mass of chemical knowledge collected under their stimulus.

A further great impetus followed the introduction by Frankland and Kekulé, in 1852 onwards, of the idea of valency and the mode of building-up constitutional formulæ. The conception of molecular constitution thus arose as a refinement on the Daltonian notion of molecular composition. In course of time the theoretical scheme once more proved insufficient to accommodate the accumulated facts, until, in 1874, van't Hoff and Le Bel demonstrated the all-important part which molecular configuration plays in the interpretation of certain classes of phenomena known to the organic chemist.

During the early days of chemical science—those of Dalton's time, and perhaps also those of Frankland and Kekulé—we can believe that chemical theory may have lacked the physical reality which it now seems to us to present. The attitude of our predecessors towards the theoretical interpretation of their observations was rather that described by Plato: "As when men in a dark cavern judge of external objects by the shadows which they cast into the cavern." In the writings of the most clear-sighted of our forerunners we can detect an underlying suspicion of a possibility that, at some time or other, the theory by means of which chemical observations are held together may undergo an entire reconstruction. A few years ago Ostwald made a determined attempt to treat our science without the aid of the molecular hypothesis, and, indeed, suggested the desirability of giving the Daltonian atomic theory decent burial.

The last ten years or so have seen a change in this attitude. The development of organic chemistry has revealed so complete a correspondence between the indications of the conception of molecular constitution and configuration and the observed facts, and recent work on the existence of the molecule, largely in connection with colloids, with radio-activity, and with crystal structure, is so free from ambiguity, that persistence of doubt seems unreasonable. Probably most chemists are prepared to regard the present doctrine of chemical constitution and configuration as proved. Though they may turn a dim vision towards the next great development, they have few misgivings as to the stability of the position which has already been attained.

De Brouwer Machinery for the Laclede Gas Company.—An installation of De Brouwer charging and discharging machinery has been provided at one of the stations of the Laclede Gaslight Company, of St. Louis (Mo.), in connection with a carbonizing plant of sixteen benches, each consisting of eight retorts, 16 in. by 26 in. by 16 ft. On each side of the retort-house there are eight benches. Coal is delivered to an overhead bunker at one end of the retort-house, from which it is taken into the charging-machine hopper. As the coke is discharged, it falls on to a De Brouwer hot-coke conveyor, which delivers it, quenched, outside the building. This system of stoking is described in "Gas Age," of New York, by Mr. J. L. Eigenbret, who says that sixteen retorts are easily dealt with in from fifteen to twenty minutes. The time required in actually laying a charge of 1200 lbs. in a retort is about twenty-one seconds, and that needed for removing the coke from the retort about twenty seconds.

A GLASGOW GAS-FURNACE INSTALLATION.

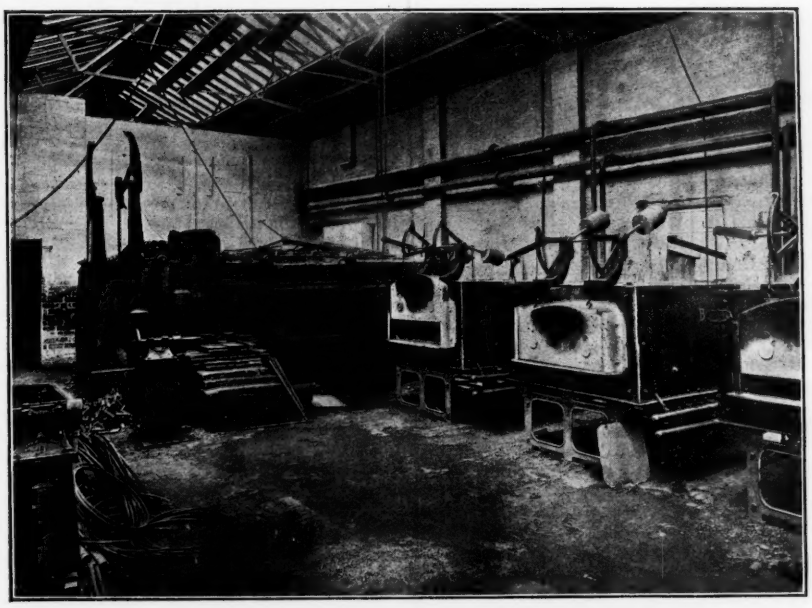
Displacement of Coal.

THE accompanying two photographs of gas-furnaces which have recently been installed in Glasgow were forwarded by Mr. Ralph Halkett, the Commercial Superintendent of the Gas Department of the Corporation, who says the working has proved eminently satisfactory. There are seven of the furnaces, and they have replaced coal-fuel furnaces in the spring-making shop of Messrs. Thomson Sterne and Co., of Glasgow.

There are many advantages which this installation has over the older method; and among them one of the chief is the reliability and uniformity of the temperature—essential points in connection with spring making. This has resulted in the turning-out of a superior quality of work. Then it will be noted, by comparing the old coal-furnace with the new gas-furnaces, that a gain of two-thirds in floor-space has been secured; while, of course, another point in favour of gas is the absence of smoke and soot in the workshop.

As to cost, it may be mentioned that the fuel bill for coal-furnaces amounted to £694 per annum. On the other hand, the gas consumption for seven furnaces per day is 20,000 cubic feet; and reckoning 300 working days gives a consumption of 6,000,000 cubic feet per annum, which (at the price charged for gas for industrial purposes) works out at approximately £425. Thus there is a saving in fuel alone of £269 a year. Further, the waste heat from the gas-furnaces is being utilized to heat the japanning ovens. In addition to the smaller outlay on fuel, a substantial saving in labour has been effected; one stoker having been dispensed with.

The satisfaction given by the installation now referred to is shown by the fact that an order has been placed for another gas-furnace 28 feet long.



RANGE OF GAS-FIRED FURNACES AT STERNE'S SPRING-MAKING SHOP, GLASGOW.

Supply of Chemical Products.—The President of the Board of Trade (Mr. Runciman) has appointed a Committee to consider and advise as to the best means of obtaining for the use of British industry sufficient supplies of chemical products, colours, and dye-stuffs of kinds hitherto largely imported from countries with which we are at present at war. The Lord Chancellor (Viscount Haldane of Cloan) is the Chairman of the Committee, and among the members are Dr. George T. Beilby, F.R.S., Mr. David Howard, Mr. Ivan Levinstein, Professor Raphael Meldola, D.Sc., F.R.S., Professor W. H. Perkin, D.Sc., F.R.S., and Mr. Thomas Tyrer (the Hon. Treasurer of the Society of Chemical Industry), together with Mr. John Anderson, of the National Health Insurance Commission, and a representative of the Board of Trade. The Secretary of the Committee is Mr. F. Gossling (of the Patent Office), to whom all communications should be addressed, at the Commercial Intelligence Branch of the Board of Trade, No. 73, Basinghall Street, E.C. The Committee held their first meeting at the Board of Trade last Friday.

METROPOLITAN WATER BOARD.

Eleventh Annual Report.

We have received from the Clerk to the Metropolitan Water Board (Mr. A. B. Pilling) a copy of their eleventh report, dealing with the work of the Board in the year ended March 31 last.

The report opens, as usual, with some explanatory observations on the constitution of the Board. It may be remembered that it came into existence in 1903, under the provisions of the Metropolis Water Act, 1902. The third Board went out of office in June, 1913, when the fourth Board was elected, and will go out of office on June 1, 1916. The Board is constituted on the principle of indirect election—viz., of representatives (66 in all) appointed by the County Councils of London, Essex, Herts, Kent, Middlesex, and Surrey, and by the Borough Councils and Urban District Councils comprised within the 559 square miles statutory area of the Board. There are on the fourth Board 18 original members of the Board first appointed in 1903.

The distribution of the Board's statutory area is as follows:—

County.	Area. Square Miles.	Acres.
London	116	576
Essex	107	56
Hertford	22	556
Kent	159	82
Middlesex	97	431
Surrey	55	160
Total	558	581

Some 180 acres (in Brasted Chart, in Kent) were added in 1914 upon statutory requisition by the Sevenoaks Rural District Council. The total rateable value of the boroughs and districts in the area directly represented on the Board, and liable to meet precepts for any deficiency that may arise, is as follows: In London, £45,119,984; extra-metropolitan counties, £11,639,372—total, £56,759,356.

The actual administration of the Board is in the hands of seven Committees—viz., Appeal and Assessment, Claims, Finance, General Purposes, Law and Parliamentary, Water Examination, and Works and Stores. The number of salaried officers on April 1 was 924, whose salaries amounted to £167,549. The number of workmen and others on weekly wages at the close of the financial year was 3146; and the service staff on weekly wages was 118. The Board granted during the year, under the provisions of the Metropolis Water Act, 1902, 52 superannuation allowances to officers and servants transferred from the late Water Companies; making a total of 493 of such allowances granted since the transfer of the Companies' undertakings to the Board. A superannuation and provident fund for the benefit of officers and servants came into operation on April 1, 1909, and the number of contributors on March 31 last was 2087—being 592 officers and 1495 servants. At that date, the Board were bearing an annual charge of about £77,000 in respect of superannuations, pensions, and compensation allowances to officers and servants belonging to the Companies. The Board have decided to provide gratuitous medical attendance to each workman who is excepted from the provisions of the National Insurance Act, 1911; and some 84 medical practitioners have already been appointed District Medical Officers over the Board's area.

The Board's supply of water is derived from the Rivers Thames and Lea, the gravel beds near the Thames, the Chadwell Spring (the beginning of the New River), and wells sunk in the Lea Valley on the north of the Thames, in Kent, and certain other points south of the river. The supply of water during the year was 89,183·7 million gallons, or a daily average of slightly over 244 million gallons. The grand total volume of water is equivalent to 398 million tons. The Thames furnished 59·1 per cent.; the Lea, 23·6 per cent.; and wells, &c., the rest. The total estimated population served by the Board at the close of the year was 6,721,207. It is estimated that 56·3 per cent. was supplied from the Thames, 25·1 per cent. from the Lea, and 18·6 per cent. from the wells and springs. Of the total population, 65·3 per cent. is north and 34·7 per cent. south of the Thames. The population inside London is 67·4 per cent. of the whole. The daily average supply per head was 36·16 gallons, compared with 35·39 gallons in 1912-13.

The effective amount of storage and subsidence reservoir capacity for unfiltered water possessed and in use by the Board at the end of the year was as follows:—

	No.	Area in Acres.	Capacity in Million Gallons.
Thames Valley	31	1026·50	7,267·5
Lea Valley	18	955·75	5,640·2
Total	49	1982·25	12,907·7

The Board are contemplating the immediate construction at Littleton of a reservoir to contain 3500 million gallons. It will be followed by an adjoining one of the same capacity, and then by a third, to be constructed at Stanwell, and to contain 3300 million gallons. These additional reservoirs are needed to cope with the ever-increasing demand for water; and it is estimated that they will enable the Board to face their obligations until some twenty years hence.

The total storage in existence, in course of construction, and authorized but not commenced, is as follows:

Storage.	Thames. Million Gallons.	Lea. Million Gallons.	Total. Million Gallons.
Existing	7,267·5	5640·2	12,907·7
Authorized, but not commenced	10,300·0	2000·0	12,300·0
Total	17,567·5	7640·2	25,207·7

The figure of 12,907·7 million gallons is exclusive of the Hampstead and Highgate ponds, and the Camden Park Road reservoir for pond water, with a total area of 29·75 acres, and a capacity of 29·9 million gallons. Adding these brings up the total number of reservoirs to 62, the area to 2012 acres, and the total capacity to 12,937·6 million gallons. The number of filter-beds is 172, of 170·69 total acreage, or 0·8 acre per million gallons average daily supply of filtered water. The average monthly rate of filtration per square foot per hour during last year varied from 0·89 gallon to 1·94 gallons.

The total length of mains *in situ* at the end of March last was upwards of 6408 miles. The diameters range from 2 to 54 inches; 4-inch pipes being mostly in use. During the year rather more than 49 miles of new mains were laid. The largest extensions were in the Kent, northern, and western districts; being respectively 29·97, 30·73, and 21·60 per cent. of the total. The length of new mains laid per additional service varied from 6·5 yards in the southern district to 32·1 yards in the Kent district; the figure for the whole area being 12·6 yards.

The following figures show the increases which have taken place under the Board in the active equipment of water-works since the transfer of the undertakings:

	Before June, 1904.	At March 31, 1914.
Storage reservoirs for unfiltered water	44	49
Acreage of ditto	843	1,982·25
Capacity of ditto in million gallons	4,047·7	12,907 7
Service reservoirs for filtered water	75	84
Capacity of ditto in million gallons	244·5	311·6
Filter beds	137	172
Acreage of ditto	139	170·7
Engines	235	276
Horse power of ditto	32,177	42,998
Miles of water-pipes	5,759	6,411

Turning to the financial position of the Board, the report shows that the funded debt on April 1 last was—

	Amount.	Interest.
"A" stock	£6,060,165	£181,805
"B" "	35,250,928	1,057,528
Redeemable debenture stocks	7,217,838	216,911
Mortgage loan	200,000	8,000
Total	£48,728,931	£1,464,244

In addition to the annual interest shown above, there are certain annuities and rent charges amounting to £7900; making a total of £1,472,144, or equivalent to 3·9d. per 1000 gallons of water supplied. The net water-rental received during the year 1913-14 was approximately £2,895,400, or an increase of £46,251. The percentage of collection for the half year ended March 31, 1914, in respect of domestic supplies and fixed charges, was 94·4, compared with 93·6 for the corresponding period of 1913.

The effect of the new charges imposed by the Board's Act of 1907 was to create a deficiency (the yield being less than that obtained under the Acts of the Water Companies). This deficiency had grown to a sum of about £305,219 by the end of the year 1913-14. But it is counterbalanced by the fact that the Board have set aside no less than £455,353 to the new works sinking fund; being bound by law to do so. Precepts were issued upon the contributory authorities in respect of the accumulated deficiency of £209,573 in the water fund in August, 1913; and further precepts in February last in respect of the deficiency for the year ended March 31, 1913, amounting to £63,647.

During the year the Director of Water Examination (Dr. A. C. Houston) submitted his ninth report on research work, which dealt with the search for pathogenic microbes in raw river water and in crude sewage. The Board have instituted at Hanworth practical experiments on the "excess lime" method of purification, which had been described in the Director's eighth annual report. Dr. Houston had proved, from laboratory experiments, that it was possible, by adding lime to impure water, to render the water bacteriologically safe; in other words, the process was capable of destroying all the microbes of epidemic water-borne disease. While emphasis must be laid upon the statement that the process should not in any way be regarded as an attempt to obviate the construction of storage reservoirs, it is of value as enabling storm water to be utilized and rendered safe, which would otherwise be unsuitable for being passed into the storage reservoirs. Thus a double purpose is served, of safeguarding the supply and increasing the quantity of raw water available in time of need, by utilizing water which must otherwise be wasted.

Accompanying the report are appendices containing a collection of tabulated statistics, Dr. Mill's report on the rainfall in the Thames and Lea Valleys, and a list of the works authorized by the Board and the progress made with them during the year.

Mr. John Horsley Palmer, whose death (following closely upon his retirement from the Boards of the British Gaslight Company and the Imperial Continental Gas Association) was announced in the "JOURNAL" for the 21st of July, left estate of the gross value of £118,365, with net personalty amounting to £117,418.

ACTION OF SULPHURETTED HYDROGEN ON HYDRATED OXIDE OF IRON.

PART III.

By S. E. Linder.

[Extracted from the Report of the Chief Inspector under the Alkali Act—See p. 390 of the "Journal" for Aug. 18.]

For the past three years the behaviour of oxide of iron during fouling and revivification operations in sulphate of ammonia works purifiers has been the subject of special consideration and research. The work was started originally in order to determine, if possible, the cause of "souring" in certain works [*vide* report, 1911]. But the question proved to be one of extreme complexity; and the scope of the inquiry had of necessity to be enlarged so as to include the investigation of side-issues of equal interest and importance. Before setting out the results obtained during the past twelve months it is desirable briefly to refer to the earlier work recorded in annual reports for 1911 and 1912.

Part I.—*See* "Annual Report, 1911."* The inquiry was directed to determine the conditions that favour "souring" of oxide. It included—

(*a*) Historical *résumé*, summarizing the results of systematic research by various workers on the properties of hydrated oxide of iron, both natural and artificial, and its reactions with sulphuretted hydrogen, and of sulphided oxide with air.

(*b*) Investigation in the laboratory of the action of hydrated oxide on mixtures of sulphuretted hydrogen and carbon dioxide, and analysis of the products.

(*c*) Works tests, being a record of observations made on the temperature attained by oxide of iron in purifiers attached to sulphate of ammonia plants, and detailed comparison of the procedure adopted at various works typical of English and Scottish practice.

Part II.—*See* "Annual Report, 1912." It included—

(*a*) Laboratory investigation on the "Valuation of Oxides as Absorbent for Sulphuretted Hydrogen by Means of the 'Sulphuretted Hydrogen Burette.'"

(*b*) Works tests on the temperature attained by hydrated oxide in sulphate of ammonia works purifiers.

During the year 1913 further research was made. The special points to which inquiry was directed were the following:—

(*a*) Laboratory investigation in continuation of Part II (*a*) above—"Valuation of Oxides."

(*b*) Consideration of the part played by ammonia in the foul gases entering the purifier in preventing "souring" of oxide.

(*c*) The temperature attained by oxide purifiers in English and Scottish practice during the sulphiding and revivification processes, with special reference to "souring."

*The main portions of these reports were, at the time of their issue, reproduced in the pages of the "Journal."—Ed. J.G.L.

It will be convenient to consider the results of each section of the work under the appropriate subhead.

(*a*) Valuation of Oxides by the "Sulphuretted Hydrogen Burette."

The "burette" and its working were described in the report for 1912, with the aid of diagrams. Briefly, the procedure consists in treating a small weighed quantity of air-dried and moistened oxide with excess of sulphuretted hydrogen in a laboratory vessel of special design; the gas being measured over mercury, with complete exclusion of air from the apparatus by means of hydrogen.

In the same memorandum the usual gravimetric method for the valuation of oxide was considered, and reasons given for rejecting the gravimetric method for exact analysis. Alternatively, the volumetric valuation by means of the "burette" was suggested as being a convenient as well as a more accurate and reliable method.

During the past year the apparatus devised in 1912 and figured in the report for 1911 was submitted to very critical use. Its working has given entire satisfaction, and no essential modifications have, so far, been found necessary, either in the constructive details of the apparatus or in the method of working it.

It was proposed to define the "efficiency" of an oxide as the "maximum volume of H_2S, measured at 0° C. 760 mm., that a given weight of oxide is capable of absorbing, calculated per 100 volumes of H_2S absorbed by an equal weight of pure ferric hydrate, $Fe_2O_3H_2O$, under similar conditions."

It was further pointed out that, on this basis, the theoretical maximum "efficiency" of an oxide expresses the amount of hydrated oxide ($Fe_2O_3H_2O$) present per 100 parts of oxide dried at 100° C.; the actual efficiency being, as a rule, much below the theoretical maximum as deduced from the percentage amount of iron present, indicating the presence of inactive compounds of iron.

The standard method then adopted for determining the "efficiency" required the use of a suitably moistened air-dried oxide; and comparison was made with a sample of pure hydrated oxide similarly prepared.

It is obvious, however, that comparison might equally well have been made between test and standard samples of oxide both dried at 100° C. and subsequently remoistened, or both dried at 100° C. and used dry for sulphiding. During the present year an attempt has been made to decide which of the three methods is the best.

Table A.—*Action of Sulphuretted Hydrogen on Pure Hydrated Oxide.*

Air Temperature.

—	Pure Hydrated Oxide (with Addition of Sand). Material as Sulphided—Moisture Per Cent.		
	Air-Dried.	Dried at 100° C. then Remoistened.	Dried at 100° C. Used Dry.
	14·5	14·5	*Nil.*
Average air temperature . .°C.	19	23	20
H_2S absorbed per gramme of oxide dried at 100° C.— :			
Contraction :—			
1 hour . . . . c.c. 0° C.	318·4	310·4	290 8
2 hours . . . . ,,	346·8	345·6	321·1
3 ,, ... ,,	359 0	360 5	339 2
4 ,, ... ,,	364·6	367 4	350·0
1 day . . . . ,,	372·4	374·0	371·4
2 days . . . . ,,	372·6	374 2	371·1
Total contraction ,,	372·6	374·2	371·1
CO_2 evolved . . ,,	..	..	..
Total H_2S absorbed ,,	372 6*	374·2*	371·1*
H_2S equivalent to $Fe_2O_3H_2O$ taken . . . . ,,	376 0	376·0	376·0
	Per 100 Parts of Sulphur as H_2S absorbed.		
Analysis of revivified product :—			
Soluble in CS_2 . "Free" sulphur	94·9	92·4	93·6
Soluble in water . $FeSO_4$, &c.	2·0 } 5·1	3·6 } 7·6	2·2 } 6·4
Other forms (by diff.) FeS_2, &c.	3·1 }	4 0 }	4·2 }
	100·0	100 0	100·0

* Note.—Sulphided oxide acid to litmus; traces of soluble sulphate. Dilute ammonia water used to moisten the material during revivification in place of water.

Table B.—*Action of Sulphuretted Hydrogen on Bog Ore.*

Air Temperature.

—	Bog Ore—Sample No. 1. Total Iron (Dried Oxide) = 61·4 $Fe_2O_3H_2O$ Per Cent. Material as Sulphided—Moisture Per Cent.		
	Air-Dried.	Dried at 100° C. then Remoistened.	Dried at 100° C. used Dry.
	20	20	*Nil.*
Average air temperature. . .°C.	12	9	12
H_2S absorbed per gramme of oxide dried at 100° C. :—			
Contraction—			
1 hour . . . . c.c. 0° C.	163·4	151·7	124·9
2 hours . . . . ,,	174·6	167·8	155·7
3 hours . . . . ,,	179·6	174·8	167·8
4 hours . . . . ,,	183 0	179·7	172·6
1 day . . . . ,,	200·0	201·8	188·8
2 days . . . . ,,	205·9	210·1	195·1
1 week. . . . ,,	214·6	223 6	208·7
2 weeks . . . . ,,	223·1	231·3	219·3
3 weeks . . . . ,,	223·3	232·8	222·5
Total contraction . ,,	223·3	232·8	222·5
CO_2 evolved . . . ,,	3·9	1·1	3·2
Total H_2S absorbed ,,	227·2	233·9	225·7
H_2S equivalent to $Fe_2O_3H_2O$ taken. . ,,	231·0	231·0	231 0
	Per 100 Parts of Sulphur as H_2S Absorbed.		
Analysis of revivified product—*			
Soluble in CS_2 "Free" sulphur	92·4	87·9	85·2
Soluble in water . $FeSO_4$, &c.	3·2 } 7·6	2·4 } 12·1	3·3 } 14·8
Other forms (by diff.) FeS_2, &c.	4·4 }	9·7 }	11·5 }
	100·0	100·0	100·0

* *See* footnote, Table A.

TABLE C.—*Action of Sulphuretted Hydrogen on Bog Ore.*
AIR TEMPERATURE.

—	Bog Ore—Sample No. 2. Total Iron (Dried Oxide) = 54·4 $Fe_2O_3H_2O$ Per Cent. Material as Sulphided – Moisture. Per Cent.		
	Air-Dried.	Dried at 100° C., then Remoistened.	Dried at 100° C. Used Dry.
	2.	24	*Nil.*
Average air temperature. . .°C.	18	19	17
H_2S absorbed per gramme of oxide dried at 100° C.—			
Contraction—			
1 hour . . . . c.c. 0° C.	160·3	161 6	118·1
2 hours . . . . ,,	166·7	..	148·0
3 hours . . . . ,,	169·3	171·1	155·7
4 hours . . . . ,,	170·9	172·9	158·6
1 day . . . . ,,	179·7	182·9	170·8
2 days . . . . ,,	182·7	..	174·7
1 week . . . . ,,	188·5	191·5	182·3
8 days . . . . ,,	189·2	191·9	182·6
9 days . . . . ,,	189·5	..	183·3
Total contraction. ,,	189·5	191·9	183·3
CO_2 evolved . . ,,	5·3	5·2	5·5
Total H_2S absorbed ,,	194·8	197·1	188·8
H_2S equivalent to $Fe_2O_3H_2O$ taken . ,,	204·5	204·5	204 5
	Per 100 Parts of Sulphur as H_2S Absorbed.		
Analysis of revivified product—*			
Soluble in CS_2 "Free" sulphur	91·6	91 6	73·1
Soluble in water . $FeSO_4$, &c.	1·9	2·3	3·6
Other forms by (diff.) FeS_2, &c.	6·5 } 8·4	6·1 } 8·4	23·3 } 26·9
	100·0	100·0	100·0

* *See* footnote, Table A.

TABLE D.—*Action of Sulphuretted Hydrogen on Bog Ore.*
R TEMPERATURE.

—	Bog Ore—Sample No. 3. Total Iron (Dried Oxide) = 59·8 $Fe_2O_3H_2O$. Per Cent. Material as Sulphided—Moisture, Per Cent.		
	Air-Dried.	Dried at 100° C. then Remoistened.	Dried at 100° C. used Dry.
	24	21	*Nil.*
Average air temperature. . .°C.	15	15	14
H_2S absorbed per gramme of oxide dried at 100° C.			
Contraction :—			
1 hour . . . . c.c. 0° C.	199·2	200·2	164·9
2 hours . . . . ,,	203·6	205·4	179·0
3 hours . . . . ,,	205·2	208·0	185·3
4 hours . . . . ,,	206·5	209·4	188 6
1 day . . . . ,,	212·4	215·5	203·1
2 days . . . . ,,	215·0	218 0	210·8
1 week . . . . ,,	220·4	220 3	217·3
8 days . . . . ,,	220·8	220·7	218·9
Total contraction ,,	220·8	220·7	218·9
CO_2 evolved . . ,,	3·7	3·3	2·6
Total H_2S absorbed ,,	224·5	224·0	221·5
H_2S equivalent to $Fe_2O_3H_2O$ taken . . ,,	224·7	224·7	224·7
	Per 100 Parts of Sulphur as H_2S absorbed.		
Analysis of revivified product :—*			
Soluble in CS_2 "Free" sulphur	92·4	93·1	87·5
Soluble in water . $FeSO_4$, &c.	2·3	2·4	2·9
Other forms (by diff.) FeS_2, &c.	5·3	4·5	9·6
	100·0	100·0	100·0

* *See* footnote, Table A.

Typical samples of bog ore were exhaustively sulphided, and the results compared with those obtained by sulphiding pure hydrated oxide under the same conditions. The three methods employed were the following :—

1. Hydrated oxide, air-dried three to four days. Moisture adjusted to 15 to 20 per cent. by the addition of water, if necessary.
2. Hydrated oxide, dried at 100° C. in air-oven until the weight is constant (= $Fe_2O_3H_2O$). Moisture content adjusted to 15 to 20 per cent. by the addition of water, as above.
3. Hydrated oxide, dried at 100° C. and used direct, unmoistened. *Note.*—Special correction if needed in this case, as the hydrogen gas used to displace air in the laboratory vessel is dry at the start and becomes moist on sulphiding.

The figures presented in tables A to D that follow may be taken as typical of the results obtained with natural oxides. They appear to show that oxide dried at 100° C. and suitably remoistened (Method 2) is in the best condition for absorption of sulphuretted hydrogen ; the amount of absorption at the end of the first day and each subsequent period being in every case greatest when oxide is used under these conditions.

Using these figures and neglecting carbon dioxide, we calculate the maximum efficiency figures for each of the three samples of bog ore by Method 2 as follows :—

x = volume of H_2S absorbed for the given period.

Efficiency.	Sample of Bog Ore.		
	No. 1.	No. 2.	No. 3.
4 hours' test = $\frac{x}{367\cdot4} \times 100$	48·9	47·1	57·0
1 day's test = $\frac{x}{374} \times 100$	54·0	48·9	57·6
2 days' test = $\frac{x}{374\cdot2} \times 100$	56 2	..	58 3
Complete saturation test = $\frac{x}{374\cdot2} \times 100$ . .	62·2	51·3	59·0
Theoretical "efficiency" calculated from the $Fe_2O_3.H_2O$ content of oxide	61·4	54·4	59·8

Revivification was effected in the manner described in the annual report for 1911, but with an important modification. The sulphide before heating to 40° to 50° C. in air was moistened with dilute ammonia water in place of ordinary distilled water, and was remoistened, as required, with the same solution. If this precaution be omitted, there is a small but distinct loss of sulphur, presumably as SO_2, and the formation of free sulphuric acid and soluble sulphate in greater or less amount according to the proportion of disulphide present and the conditions of oxidation.

If, on the other hand, ammonia water be used, the sum of the sulphur equivalents of the "free" sulphur, soluble sulphate, and disulphide and other forms found by oxidation with fuming nitric acid or fusion with potassium nitrate and carbonate, is equal to the sulphur as sulphuretted hydrogen absorbed.

Action of Sulphuretted Hydrogen on Ignited Oxide.

It is a well-known fact that hydrated oxide after ignition is very sluggish in its action on sulphuretted hydrogen [*vide* report for 1911]. Ignited hydrate appears to be incapable of becoming rehydrated by exposure to damp air, even if the time of exposure be prolonged for several months, and the oxide be kept moist by frequent wetting with water or with dilute ammonia water. But although incapable of taking-up moisture to form hydrated oxide, ignited oxide is active towards sulphuretted hydrogen, and can be completely sulphided if the time of exposure be made long enough. The sulphide formed is dense and hard ; and re-oxidation by exposure to air is effected very slowly, even if the material be ground to powder and kept at a temperature of from 40° to 50° C., with the addition of ammonia water from time to time. Thus, Table E, Sample (*a*) :—

	Grammes.
Total H_2S absorbed, calculated as sulphur	·266
Sulphur recovered in the free state by oxidation—	Grams.
1 day	·0403
1 day further	·0190
2 days ,, ...	·0143
16 days ,, ...	·0105
8 days ,, ...	·0072
6 days ,, ...	·0003
	·092
Disulphide and other forms (by difference) . .	·174

In Table E are presented figures which show the result of sulphiding two samples of pure ferric hydrate after ignition (Fe_2O_3). Sample (*a*) after ignition was exposed to air for two months with occasional addition of water, followed by three months without moistening. Sample (*b*) was similarly exposed to air ; ammonia water being used in place of water. Reweighed at the end of the five months after drying at air temperature, neither sample showed any gain in weight. Sample (*b*) after sulphiding yielded in nine days 33·1 per cent. of "free" sulphur, calculated on the total weight of sulphur as H_2S absorbed. After extraction with carbon disulphide, and on further exposure for six days, no more "free" sulphur was obtained. Sample (*a*), on the other hand, took 28 days before the full weight of "free" sulphur was obtained—34·5 per cent.

The behaviour of ignited oxide is of interest in view of recent attempts to utilize burnt pyrites and other furnace products for purification purposes. So far as they go, the results of the valuation tests on this material must be considered disappointing, as the revivified product is seen to consist mainly of disulphide—a body inert towards sulphuretted hydrogen, and capable of yielding

TABLE E—*Action of Sulphuretted Hydrogen on Pure Hydrated Oxide Before and After Ignition.*

AIR TEMPERATURE.

—	After Ignition. (a) Wetted with Water and Exposed to Air 5 Months.	After Ignition. (b) Wetted with Ammonia Water and Exposed to Air 5 Months.	Before Ignition. Dried at 100° C., then Remoistened.
	Material as Sulphided—Moisture, Per Cent.		
	21	24	14·5
Average air temperature. . °C.	11	11	23
H_2S absorbed per gramme of oxide dried at 100° C. :—			
Contraction—			
1 day . . . . c.c. 0° C.	..	142·8	374·0
2 days . . . ,,	147·7	..	374·2
7 ,, . . . ,,	333·2	349·0	..
13 ,, ... ,,	369·3	373·4	..
14 ,, ... ,,	369·9	375 8	..
18 ,, ... ,,	..	382 6	..
19 ,, ... ,,	..	382·8	..
Total H_2S absorbed ,,	369·9	382 8	374·2
H_2S equivalent to $Fe_2O_3H_2O$ taken . ,,	376 0	376·0	376·0
	Per 100 Parts of Sulphur as H_2S Absorbed.		
Analysis of revivified product—			
Soluble in CS_2 " Free " sulphur	34·5	33·1	92·4
Soluble in water . $FeSO_4$, &c.	6·8 } 65·5	3 3 } 66·9	3 6 } 7 6
Other forms (by diff.) FeS_2, &c.	58·7 }	63 6 }	4·0 }
	100·0	100 0	100·0

soluble sulphate and acid products only on prolonged exposure to air, and under conditions which favour " souring " of the hydrated oxide with which it is associated.

Influence of Hydration on Rate of Sulphiding and Character of Products.

The intimate relationship that exists between the degree of hydration of an oxide and its efficiency as an absorbent of sulphuretted hydrogen has been discussed in earlier reports [1911 and 1912]. The results presented in Tables A to E afford further evidence of the correctness of the views previously expressed. Analysis of the revivification products clearly shows that when the degree of hydration is low, there is a marked increase in the amount of disulphide formed (and subsequently of its oxidation product, ferrous sulphate). A due degree of hydration, therefore, is of the first importance if the efficiency of an oxide is to be maintained. There is reason to believe that the hydration condition of the oxide in use at many sulphate of ammonia works is by no means as carefully safeguarded as it should be.

Sample.	Soluble Sulphate and Disulphide Obtained on Oxidation Calculated as Sulphur per 100 Parts of Sulphur as H_2S Absorbed. Material as Sulphide. Oxide Air Dried.	Oxide Dried at 100° C.	Oxide Ignited.
Pure hydrated oxide	5·1	6 4	65·5
Bog ore, No 1	7 6	14·8	—
,, ,, 2	8·4	26·9	—
,, ,, 3	7·6	12·5	—

(b) Ammonia: Its Presence in Saturator Gases, with Special Reference to its Influence in Preventing " Souring " of Oxide.

In the annual report for 1911, the chemical reactions that are considered to occur when hydrated oxide of iron is successively sulphided and re-oxidized by exposure to air were very fully discussed, and an attempt was made to apply the views enunciated by Gedel to explain the results obtained in sulphate of ammonia works practice. The conclusion was reached that if Gedel's views be accepted with respect to the specific effect induced by the presence of traces of ammonia in the reacting gases, " we should look for ' souring ' in works where conditions of working favoured the absence of ammonia in the waste gases, and where the temperature of the oxide was high enough to favour the formation of ferrous sulphate and disulphide."

Through the courtesy of the management, experiments were carried out at four works (two English and two Scottish) to determine the average amount of ammonia entering the oxide purifiers with the foul gases by a concurrent test extending over from ten to twenty hours. The ammonia was determined by drawing a sample of the gas by a water aspirator first through a series of acid catch-bottles, and thence through a small meter at the rate of about ½ cubic foot per hour. In the case of the three works for which figures are presented in the table, the amount of ammonia in the catch-vessels was determined by distillation; blank experiments being carried out as check, using the same volume of reagents. The amount of ammonia found was in each case very small; but in the case of the two English works the weight found per cubic foot was nearly twenty times that found in the Scottish works A; at Works D even less was found by the chemist in charge of the test—not more than 0·001 gramme of NH_3 per cubic foot (average amount on six tests).

The results are hardly decisive enough to base any hypothesis upon; but they confirm the conclusion previously reached from a consideration of other facts, that the amount of ammonia in the foul gases in Scottish works is extremely small—certainly insufficient to neutralize acid conditions set up as the result of defective working of the oxide from obscure causes to be considered later.

Ammonia in Foul Gases entering Oxide Purifiers.

—	Souring Chronic.	Souring Absent.	
	Work A, Scottish.	Work B, English.	Work C, English.
Purifier	Walled, roofed.	Heap, roofed	Heap, roofed
Character of oxide	Irish bog ore charged fresh with addition of some old oxide.	Irish bog ore charged fresh.	Westbury bog ore from gas purifiers.
Per cent. moisture.	..	10·8	5·8
Gas liquor, per 100 c.c. :—			
Total NH_3 . . . grammes	1·760	1·733	1·190
CO_2 . . . . . ,,	1·936	1·349	1·413
H_2S . . . . . ,,	0·229	0·419	0 189
HCy. . . . . ,,	0·041	0·0.8	0·016
Saturator gases, per 100 vols. calculated :—			
CO_2.	84 2	69 7	83·9
H_2S	12·9	28·0	14·6
HCy	2·9	2·3	1·5
	100·0	100·0	100·0
	20-hour Test	18-hour Test.	8-hour Test.
Entering purifier. Grammes per cubic foot of gas, 0° C. 760 mm. :—			
H_2S as sulphur, calculated	5·2	10·3	6·2
NH_3 found . . . . (a)	0·001	0·017	0·019
,, ,, ... (b)	0·001	0·024	..
Maximum temperature reached locally during sulphiding of oxide.	..	66° C.	65° C.

(c) Temperature attained by Oxide Purifiers in English and Scottish Practice during Sulphiding and Revivification Process.

During the past year opportunity has been taken of the periodic visits paid by inspectors to sulphate of ammonia works to make a very complete study of the working conditions of oxide purifiers in all parts of the country, both with respect to the condition of the oxide charged and the maximum temperature attained in the active layer during the sulphiding and revivification processes. Observations have been made by the staff on the working of over 220 purifiers. The figures are of value, therefore, as embodying the experience of very varied practice. Before proceeding to discuss the results, it is desirable briefly to refer to the conclusions reached in the annual report for 1912, with respect to the factors that control more especially the efficient working of the oxide of iron purifying process. In the sulphiding operation three factors were named: (1) Hydration; (2) temperature; (3) air. Excluding the third factor, air, from consideration, as concurrent aëration of the oxide was not practised in any of the works at which the special tests were made and recorded in the tables, we have to take account only of hydration and temperature.

As regards hydration, while an excessive degree of moisture is undoubtedly prejudicial to the efficient working of an oxide purifier, insufficiency of moisture is equally to be avoided. A moisture content of 10 per cent. is considered to be very suitable for sulphiding; and the oxide should be in a slightly damp or "crumbly" condition for maximum efficiency.

With respect to temperature, oxide fouled in the laboratory at about 60° C. gave the maximum yield of "free" sulphur and a minimum yield of sulphur as disulphide and other forms; and 40° to 50° C. is considered to be a very suitable working temperature for an oxide purifier. Mr. Bailey's experiments described below show that no excessive rise of temperature need be apprehended with hydrated oxide suitably moistened, even with the strongest gas.

In conducting the revivification process greater caution is called for—considerations based on thermo-chemical data show that the ignition temperature of a sulphided mass may readily be reached on exposure to air, if revivification be incautiously practised and in the absence of a due proportion of moisture. [*Vide* report for 1911.] In the laboratory investigations above referred to, 40° to 50° C. was found to be a very suitable temperature indeed for revivification.

If we may accept these criteria as affording general guidance in

Sulphiding Stage.—Working of Box and Heap Purifiers Compared.

District.	Number of Purifiers Tested.	Condition of Oxide.							Maximum Temperature of Oxide Tested.		
		*Average Number of Days Fouling.	*Height of Test Point above Grid.	Of Total Oxide Tested.					Highest Maximum Temperature in any Purifier.	Lowest Maximum Temperature in any Purifier.	Average Maximum Temperature for all Purifiers.
				Per Cent.*		Per Cent.*					
				Virgin.	Revivified.	Dry.	Moist.	Wet.			
1. ROOFED PURIFIERS.			Ins.						°F.	°F.	°F.
England and Wales—											
(*a*) Boxes	40	6	12	..	100	85	10	5	144	73	106 (41° C.)
(*b*) Heaps	13	2	9	10	90	75	25	..	149	108	124 (51° C.)
Scotland—											
(*a*) Boxes	6	10	6	..	100	85	15	..	84	50	61 (18° C.)
(*b*) Heaps	2	6	5	..	100	50	50	..	109	73	91 (33° C.)
2. OPEN PURIFIERS.											
England and Wales—											
(*a*) Boxes	20	2	12	15	85	35	45	20	118	63	90 (32° C.)
(*b*) Heaps	48	5	10	15	85	50	25	25	135	73	106 (41° C.)
Scotland—											
(*a*) Boxes	9	18	3	10	90	90	10	..	77	52	61 (16° C.)
(*b*) Heaps	5	6	4	20	80	80	20	..	91	45	64 (18° C.)

Revivification Stage.—Working of Box and Heap Purifiers Compared.

1. ROOFED PURIFIERS.			Ins.						°F.	°F.	°F.
England and Wales—											
(*a*) Boxes	15	7	11	10	90	90	10	..	118	75	97 (36° C.)
(*b*) Heaps	12	8	8	..	100	60	40	..	144	106	126 (52° C.)
Scotland—											
(*a*) Boxes	8	21	7	..	100	90	10	..	73	50	61 (16° C.)
(*b*) Heaps	..	..	..	..	..	..	..	..	..	..	..
2. OPEN PURIFIERS.											
England and Wales—											
(*a*) Boxes	14	14	10	..	100	45	25	25	113	61	79 (26° C.)
(*b*) Heaps	17	4	14	5	95	45	50	5	138	72	108 (42° C.)
Scotland—											
(*a*) Boxes	5	22	4	..	100	80	20	..	81	50	59 (15° C.)
(*b*) Heaps	9	50	4	50	50	80	20	..	81	45	57 (14° C.)

* NOTE.—In averaging these figures account is taken of the number of purifiers tested in each district.

working practice, the following conclusions may be drawn from the figures presented in the tables:—

1. That in English practice a box or heap purifier, roofed over, is suitable for use in a sulphate of ammonia works, provided that due care be taken to ensure that the oxide is not allowed to get too dry. Of the two, the heap form would appear to be more suitable for general use.
2. That in Scottish practice the conditions of working are such as to lower the working temperature of the purifier and thereby prolong unduly the "life" of the oxide.

Cause of "Souring" of Oxide in Scottish Works.

The lower working temperature of oxide in Scottish practice is, in the main, due to the special character of Scottish gas liquor, which in general is lower in its proportion of ammonia and relatively high in carbonic acid compared to sulphide. [*Vide* the report for 1911.] But the lower average atmospheric temperature in the North is also a contributing cause; and the purifying area in Scottish works is relatively large compared with that in English practice. There is reason to believe, also, that the amount of ammonia leaving the saturator and entering the purifiers in Scottish practice is less than in English practice. But the amount of evidence at command is too limited to admit of generalization; and one has to remember that ammonia may be prejudicial to the health of the oxide when cyanides are present. The intimate connection that exists between a "sour" oxide and the amount of disulphide formed during the sulphiding operations was fully discussed in the annual report for 1911. Disulphide is formed more especially at higher temperatures; but it appears to be normally present in sulphate of ammonia purifiers as one of the reaction products. The lower sulphides of iron (that is, FeS and Fe_2S_3) oxidize relatively with great rapidity; the disulphide relatively slowly. It is clear, therefore, that if the conditions of working are such as to unduly prolong the life of an oxide, the time of contact with air of any disulphide present in the upper layers of the purifier during the sulphiding stage and in the whole mass of material during the revification period would be greatly extended, and opportunity given for oxidation of the disulphide to soluble sulphate and free acid. This may be the true explanation of souring. Certainly the working temperature of the purifiers in Scottish practice is insufficient to account for the excessive amount of soluble sulphate that accumulates in the material.

It is possible to restore the activity of "sour" oxide, either wholly or in part, by treatment with milk of lime, ammoniacal liquor, or solution of soda ash; but managers are often reluctant to employ such means, and, indeed, there are obvious disadvantages attending the use of fixed alkali where the oxide is subsequently burnt as a source of sulphur dioxide in sulphuric acid making. It has to be remembered, also, that free alkali in the oxide is undesirable when cyanogen is present in the waste gases, as it promotes the formation of ferrocyanide and prussian blue upon the surface of the oxide particles.

It is better, where possible, to seek a remedy for the "souring" evil by prevention rather than by the application of chemical treatment after the mischief is done. In any case where the working temperature of a box purifier is unduly low, it might be found practicable to raise the temperature of the oxide by replacing the box by a heap suitably roofed-over to exclude rain, or even by slight preheating of the saturator gases after condensation and before admission to the purifier. Undoubtedly, the procedure that suggests itself as being the best to follow in cases where "souring" is a chronic source of trouble would be the use of heap purifiers of small dimensions with frequent transfer, where possible, of the oxide to the gas-works purifiers, where conditions would be suitable for complete sulphiding of the mass in absence of air. By this means any soluble sulphate present in the oxide would tend to be neutralized by traces of ammonia entering with the crude coal gas, and disulphide effectually excluded from contact with air in the surface layers of the material during the sulphiding stage.

LABORATORY EXPERIMENTS ON FOULING OF OXIDE OF IRON.

Mr. H. J. Bailey has carried out an interesting series of experiments to determine the temperature attained by oxide of iron when fouled with undiluted sulphuretted hydrogen gas at varying rates of flow and in absence of air. After fouling, the material was revivified by exposure to air in a thin layer. The process of sulphiding and revivification was then repeated, four times in all, so as to imitate on a reduced scale the operations that take place in a works purifier.

The oxide employed for the tests was an artificial oxide ready mixed with fibrous material, &c., for use in an oxide purifier box:

Moisture content of original oxide . . . . . 27·7 per cent.
Carbonates in dried oxide, calculated as $CaCO_3$. 5 1 ,, ,,
Sulphates ,, ,, ,, SO_4 . 11 0 ,, ,,

(equals 7·9 per cent. for oxide containing 39 per cent. of free sulphur.)

Three series of experiments were carried out, using 150 grammes of the undried oxide for each experiment. The oxide was fouled in an ordinary calcium chloride glass tower, and was supported on a layer of glass wool. Sulphuretted hydrogen gas was generated by acting on sulphide of iron with dilute sulphuric acid in a suitable generator. The gas was passed through a Woulfe's bottle containing water, and thence passed direct into the tower; the rate of flow being regulated by a stopcock so as to complete the sulphiding of the oxide in the desired time, as judged by the visible blackening of the mass and the escape of unabsorbed gas at the surface. The temperature of the mass was determined by means of a thermometer placed with its bulb in the active layer. At the conclusion of the experiment the sulphided material was revivified by exposure to air in an open porcelain dish in a layer sufficiently deep to just cover the bulb of a thermometer laid down in the material. Every fifteen minutes the oxide was stirred up thoroughly until the temperature had begun to fall. When the

oxidation was complete, the material was returned to the tower and resulphided. The moisture content of the revivified oxide varied from 7 to 15 per cent. in the experiments.

The results are presented in the following table:—

Action of Strong Sulphuretted Hydrogen on Artificial Oxide. Mr. H. J. Bailey's Experiments.

Sulphiding.	Sulphiding Stage.			Revivification Stage.					
	Maximum Temperature, °C.			Maximum Temperature °C.			Sulphur Formed Per Cent on Dried Oxide.		
	Time Occupied in Fouling.			Sample.			Sample.		
	A. 2 Hours.	B. 1 Hour.	C. ½ Hour.	A.	B.	C.	A.	B.	C.
First . .	50	58	62	33	43	48	8·8	12·0	10·0
Second . .	70	85	98	74	62	67	24·8	23·6	22·4
Third . .	45	85	95	54	54	64	31·8	31·4	29·8
Fourth . .	58	78	80	58	51	56	39 8	39·0	38·4
							Sulphate per Cent. as SO_4.		
							8 4	8·5	8·2
		Present in Original Oxide.					7·9	7·9	7·9

Mr. Bailey's results indicate that an increase in the rate of fouling is attended by a very definite rise of temperature; but it is clearly shown that with a suitable oxide properly hydrated, and when air is excluded, the rise of temperature on sulphiding is extremely moderate, even when strong sulphuretted hydrogen gas is employed. There was no appearance of "souring" in any of the experiments. The calcium carbonate present in the oxide would, of course, assist in keeping the oxide in a healthy condition; but in Mr. Bailey's experiments the increase of sulphate is extremely small. Free acid or soluble sulphates do not appear to be primary products of the reactions under the conditions of the experiment.

WILSON VERTICALS AT ARBROATH.

Inspection of the Installation.

Of a quiet character, owing to circumstances, an inspection was made last Tuesday afternoon by the members of the Arbroath Town Council of their new installation of Wilson continuous intermittent vertical retorts. In addition to the councillors, there were present Mr. Alexander Yuill (Dundee), Mr. David Vass (Perth), and Mr. J. W. Napier (Alloa). Mr. Alexander Wilson, of Glasgow, would have attended, but found it impossible, owing to an engagement in Glasgow.

The installation adopted is capable of producing 750,000 to 850,000 cubic feet of gas per 24 hours, and consists of a bench of 24 retorts in units of four. The plant installed is suitable for almost any class of coal; and the absence of complicated parts and delicate machinery makes it so simple that the average stoker can readily understand it and work it efficiently.

The coal is fed into the retorts through special valves, at intervals of three or four hours, as desired, in quantities of 7 to 10 cwt. at a time—a corresponding bulk of coke being withdrawn at the bottom beforehand. The special coke bogies running on rails are designed to permit of any desired quantity of coke being withdrawn at will. A water-containing bucket forms the base of the retort; and while the coke is being withdrawn, it is finally cooled with water, which has the effect of keeping it comparatively soft, and most suitable for all ordinary purposes.

Coal and coke storage hoppers of 48 hours' capacity for feeding the retorts and producers are placed overhead, side by side, and have a total capacity of 180 tons of coal and 36 tons of coke.

The water-containing buckets are opened and closed by small hydraulic rams; the high-pressure water supply being obtained by a small hydraulic installation, consisting of a duplex steam-pump, working with 60 lbs. steam pressure, and feeding into an accumulator loaded to give a working pressure of 450 to 500 lbs. per square inch. The accumulator is provided with an automatic starting and stopping gear, which, when it is filled, closes the steam supply to the pump, and which, when water is drawn off, opens the steam-valve and starts the pump again. The discharge water from the retort-rams passes back to a cistern, and is again pumped back into the accumulator. Provision is made on the accumulator ram to prevent it being forced out of its cylinder; and there is a pressure relief valve as a stand-by, should the automatic gear break down at any time.

The coal is brought from the coal-stores in tipping waggons, running on rails laid on the floor of the house, and before being emptied into the coal-receiving hopper of the elevating plant is weighed on a machine which, besides indicating the weight of coal direct, prints it on a paper-band, and thus enables the quantity of coal used to be determined at any time.

The coal-receiving hopper is placed in an underground pit, covered on top with steel chequered plates, and has a regulating valve on the bottom to regulate the supply of coal to a rotary filler, which distributes the coal in equal quantities to the elevating buckets, which in turn convey the coal to the overhead storage hoppers, where, by means of dumpers, it is distributed into the various compartments. The coke for the producers is conveyed in the same manner.

The conveyor is of the endless chain gravity bucket type, capable of dealing with 20 tons of coal per hour, when running at a speed of 45 feet per minute, and is driven by a 20 H.P. gas-engine.

An electric hoist extending from the ground level to the top of the storage bunkers has also been provided as a stand-by, in case of breakdown of the elevating plant; and this enables the coal or coke bunkers to be filled by means of the bogies. In front of the retort-house a coke-bank has been formed, over which the coke from the retorts is tipped for taking away by carts. The rails under the retorts extend along the outer edge of the bank, and connect at the opposite end to the line into the coal-store.

Messrs. R. & G. Hislop, of Paisley, were the contractors for the retort-bench and retorts, retort-house, overhead coal and coke bunkers, elevating plant, steel work and machinery in the elevator pit, gas-engine, hoist, rails, and coke embankment The contract for the foundation, which is in the form of a raft placed on ferro-concrete piles, and the concrete work of the elevator-pit, was carried out by the representatives of the late Mr. Andrew Fife, of Arbroath. The engine-house roof, the roof over the pit, and the connections from the new to the old foul main were undertaken by Messrs. Henry Balfour and Co., of Leven; while the mason work of the engine-house and other parts was done by Messrs. Ramsay and Gordon, of Arbroath. Steam, water, and gas piping and drains were put in by the Corporation's own employees.

Some Interesting Remarks.

Councillor W. J. Anckorn (the Convener of the Gas Committee) expressed his great satisfaction with the new plant now in the possession of the Council, and congratulated Mr. A. C. Young (the Engineer) and the contractors upon the way in which the work had been carried out—without a hitch, and without any accident to the men.

Dean of Guild Wilson, in moving a vote of thanks to the Convener, specially mentioned the energy and great interest shown by him in connection with the gas-works since he was appointed Convener in November last.

Mr. A. C. Young (in response to the Convener's invitation) said the vertical retorts had been in use for about a month; and though it was too early to say what the full benefit of the new plant would be over the year, there were sufficient data during the month to encourage him to state that the plant would quite come up to the original estimate which he placed before the Gas Committee when the question of installing stoking machinery was being considered. The work was much easier for the men. With the old system, a large number of men had to be taken on every winter. It was not possible to get the same men back as the new season came round, and the consequence was that new men had to be taught the carbonizing each winter. The new plant having been started in mid-summer, when few men were employed on carbonizing, it would not be necessary to dispense with many men. None of the men who were employed last summer had been dispensed with as yet; these being employed at the moment doing repairs and painting in the works. The work was delayed this season with that end in view; and he believed there was sufficient work to give these men employment until well into the winter, when they could be drawn upon as the output of gas increased. In future, it would be necessary to dispense with much labour in the early spring, as the work of repairs could be levelled up in such a way as to employ during summer some of the extra labour required in the winter. There would therefore in future be much less fluctuation in the number of men employed as between the summer and winter seasons. All the contractors had proved very anxious to give of their very best. Messrs. R. & G. Hislop were exceptional in their endeavour to substantiate the high name they had already achieved in Scotland for good work. He was pleased to say that, in his opinion, a very good and efficient plant is now in the possession of the Corporation. He congratulated the contractors on the fact that there had been no accident to any workmen employed on the edifice, the erection of which at such an altitude had called for extreme care, both on the part of the contractors in supplying proper plant and tools and on the part of the workmen themselves. He thanked all the contractors for their courtesy to him in the course of the performance of his duties as Engineer; and he also thanked the Gas Committee and the Town Council for the confidence they placed in him when they decided to erect the plant now inspected. It would be the earnest endeavour of all the employees to see that the community of Arbroath obtained the very best result possible from the future working of the vertical retorts.

Mr. George Hislop (for Messrs. R. & G. Hislop) replied to Mr. Anckorn for the contractors, and presented the Convener with a handsome silver cake stand, and Mrs. Young with a beautiful silver tea service.

Mr. Anckorn and Mr. Young having suitably returned thanks for the gifts,

Mr. Alexander Yuill spoke in high terms of the very fine plant, and complimented the Council on their enterprise. He said he was satisfied that the results would show that the expenditure was justified, and that the vertical retorts would prove a great success, both from a financial and from a consumer's standpoint. Of late years Scotch gas-works had been seriously troubled with naphthalene; and the vertical retorts would be a perfect cure for this.

The meetings of the Municipal Water-Works Association, which were to have been held in Liverpool this year, have been abandoned in consequence of the war.

A PRETTY GAS-WORKS.

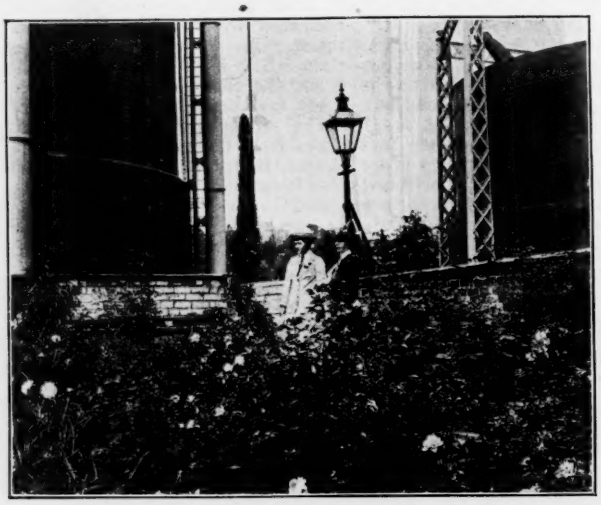
Flowers at Ludlow.

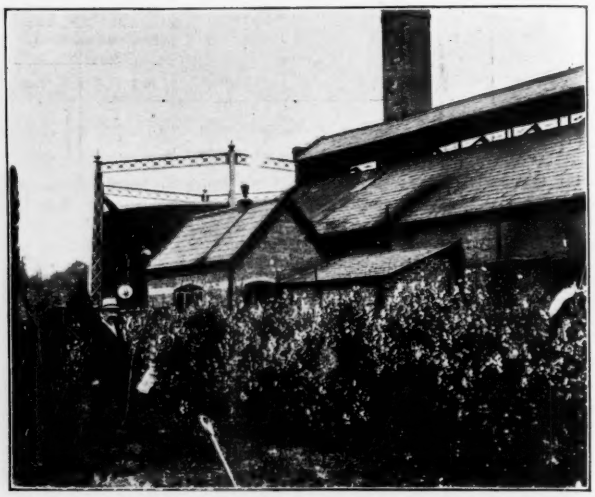
THE two photographs reproduced here picture such a gas-works as anyone might wish to be engaged in. They were forwarded by Mr. A. M.'I. Cleland, of Belfast, who sent with them the following remarks.

When in Ludlow last week, I happened to notice, in passing the gas-works, that a couple of very fine and healthy pear trees, laden with fruit, were growing up the retort-house gable, rising from a beautifnl bed of calceolarias and scarlet geraniums. While my wife and I were admiring the healthy, bright looks of both fruit and flowers, a young lady entered the gateway of the works, and seeing we were interested in the flowers suggested that we might like to look round her garden. The young lady proved to be Miss E. F. Dean, daughter of Mr. H. J. Dean, the courteous Manager of the Ludlow works. Her garden is formed in a space of ground between the workshops, retort-house, and gasholders, part of it being laid out over the tar-tanks; and though I am familiar enough with the possibilities of gas-works gardens, I was astonished at what I saw at Ludlow.

I had my camera with me, and asked permission to take some photos, of which the enclosed prints are the results. I could only use ordinary plates, having no isochromatic ones with me. You will be interested to know that the exposures were made on Aug. 21, during the middle of the eclipse of the sun.

One photo shows Miss Dean among her roses (nearly over at the time of my visit) for which she was awarded second and third prizes at this year's Ludlow Flower Show and first prize at Bromfield. The other photo shows Mr. Dean standing among the sweet peas, for which his daughter was awarded third prize at Ludlow. Her gladioli also took third prize. The sweet peas are growing in beds formed actually over the tar-tanks.





SOME PRESENT OPPORTUNITIES FOR BRITISH MANUFACTURERS.

By AMICUS.

THE present crisis has been the means of bringing home to us very forcibly the enormous extent to which we are dependent on Germany for many of the necessities of our industrial life. Raw materials and finished products in many cases nominally held by British interests have turned out to be under the direct control of German concerns; and so intimately have these been bound up with British requirements that the first few weeks of war has made the position of numerous British manufacturers a very difficult one. For many years Germany has been making a bid for both British and Colonial markets. She has more particularly directed her attention to those industries which depend principally on the commercial application of scientific processes. She has by no means confined herself to this side of industrial development, however, but has also developed considerably in engineering matters, as is evidenced by the progress of such concerns as the "Bamag" and "Demag," and also the many well-known makers of large gas-engines, &c. The development of the British discovery of aniline dyes by the Germans is perhaps one of the most remarkable instances of German foresight; for practically the whole coal-tar colour industry is now in German hands.

From the same point of view, it is interesting to review the German connection with the gas and coke-oven industry, taking into account not only the carbonization of coal by the various systems, but also considering the various allied and subsidiary industries, and the recovery of bye-products and the subsequent working-up of these. The carbonization of coal for gas-making purposes originated in this country; and largely on account of the late development of German industrial works, this country was enabled to have a considerable start in the matter of systems of carbonization. It is interesting to note, just here, that one at least of the earliest successful systems of vertical retorts originated in Germany. In the coke-oven industry, however, matters are somewhat different. It was not until some eight or ten years after the Franco-German war, and at the commencement of the great development of Germany as an industrial power, that bye-product coking was introduced. Almost immediately it was taken up with avidity by the scientifically-minded Germans, and much of its development is undoubtedly due to the researches and trials of German firms during the last ten or twenty years of the Nineteenth Century. As a result, Germany holds a unique position among the nations which carry on the manufacture of metallurgical coke, inasmuch as she has entirely discarded the wasteful beehive oven, and thereby is conserving her resources considerably. It has been shown over and over again that bye-product ovens possess incalculable advantages over beehive ovens, and yet this country—and it might also be added the United States—still goes on in the same old way, wasting millions of pounds' worth of commodities by failing to discard what are admittedly unscientific and uneconomical methods of production.

Here, then, lies the secret of much of the German industrial progress. We do not for a moment admit they are our mental superiors, or that the business acumen and foresight of Britons are inferior to that of the Germans; but there can be no shadow of doubt that we have not yet fully realized the power of the combination of Science with Industry. By Science, we do not mean matters purely academic, but rather the association of the theory of the lecture room with the practice of the works. Applied Science is what is required, and Germany has so perfected her system of technical education that, in theoretical instruction, practical works problems are introduced and stu died, and the theory correlated with practice at every possible point. Theoretical training and practical experience must necessarily go hand in hand; and Germany has been able to avoid that sneer of contempt with which the "college men" of this country are so often met when they venture to tread in industrial fields.

It is, therefore, both interesting and instructive to consider the bye-product coking industry in detail, for it is a valuable and a growing industry, and there is absolutely no reason why it should not be of much greater value to British manufacturers than it was before the war. As far as the design of coke-ovens is concerned, there is not a great deal to be done. There are on the market a number of well-tried systems, including those of the Otto, Coppee, Semet-Solvay, Koppers, Simon Carves, Simplex, Still, Huessener, and Collin. All bye-product coke-ovens at present at work in this country are of one or other of the above types; and of these, Otto, Koppers, Still, Huessener, and Collin are of German origin, though they are now erected by companies established in this country. The remaining systems are of Belgian or French origin. It is naturally a somewhat difficult matter for any new system, British or foreign, to get a hold in this or any other country, owing to the fact that it would be a dangerous experiment for anyone to put up an untried plant. All these coke-ovens are of the horizontal type. Many attempts have been made to produce a vertical coke-oven, but as yet these have not been satisfactory. Perhaps the Woodall-Duckham vertical retorts of large section might eventually lend themselves to development in this direction. With horizontal ovens, much ground space is required, and also very expensive coal-charging and coke-discharging machines are required. Vertical coke-ovens, therefore, offer many advantages, and there is considerable incentive for would-be designers in this direction. Naturally, there are some difficulties to be faced in the

construction of a suitable vertical oven; but with the experience which has been gained with vertical retorts—particularly with those of British origin—these difficulties should not prove to be insuperable. When they are overcome—as the writer fully believes that they will be eventually—there is a large field before the designer.

It is a striking fact that a very large proportion of the materials used in the construction of bye-product coke-ovens comes from the Continent. It may be, of course, that on account of the Continental origin of all the coke-oven firms there is some predilection towards Continental material; but there are few (if any) businesses which will allow of sentimental buying unless there is also some advantage in the matter of price. Where there is such advantage, sentiment counts for very little. It is generally admitted that we have in this country some of the finest raw materials in the world for the manufacture of refractory materials, firebricks, &c., and yet very often do we find coke-oven builders use Continental bricks for those portions which are subjected to the most intense heat in the oven. During the last eighteen months or so much has been written in the Technical Press concerning the relative merits of British and Continental firebricks; but the more general opinion held by coke-oven people is undoubtedly in favour of the Continental brick. In some instances, British bricks have been tried and found to be quite satisfactory, but generally speaking this has been due to chance more than to the brickmaker. Putting it broadly, the Continental maker studies the scientific side of his brick making, and is prepared to adapt his output so as to meet any required specification. If a brick is required for a particular purpose, in almost every case the Continental maker can recommend a suitable brick, and what is more he can usually back-up his recommendation with some concrete facts. He knows his brick; its composition; its expansion or contraction; its power of withstanding corrosion; its fusing-point; and, in general, its suitability for any particular purpose. This information is freely at the disposal of the buyer, and is no doubt of considerable importance to him when considering the various features of his design and construction.

It will not be denied by those in a position to know, that in many cases in this country brick making is carried on by rule-of-thumb, and that, further, many works boast that "a laboratory is not necessary to enable them to make bricks." Such a statement is, of course, quite true; but the laboratory is absolutely essential if they are to make the best bricks. Therein then lies the difference. British manufacturers have the best raw materials; they also know how to make bricks. The only thing lacking is the controlling scientific interest and advice; and it is not necessary either to go out of the country to obtain this. Naturally, the employment of laboratory control means a little more expense in the first instance; but this is rapidly more than made up for by the increased efficiency of the operations and the improved character of the finished product. British firebricks can be made to equal, if not surpass, Continental products if only the manufacturers are prepared to spend a little money on properly directed experiments under the control of some competent authority. And there is no time like the present. At many collieries installations of coke-ovens cannot be completed owing to the fact that Continental bricks cannot be had. It should not be outside the bounds of possibility for British manufacturers to at once come forward and permanently capture this trade.

The manufacture of a large proportion of coke-oven machinery and coal-washing plants is also in the hands of foreign firms. On account of the fact that coke-ovens were largely developed abroad, this can be partially explained; but there is no reason whatsoever why British firms should not now step in. Practically every coal-charging machine in use on coke-oven plants where compressed coal is used is of foreign manufacture. As these machines cost in the neighbourhood of £2500, it will be seen that a considerable sum of money is involved. The requirements of such a machine are perfectly well defined and understood by coke-oven people in this country, and surely our British engineers have the skill to design a machine to meet these requirements.

The development of the modern methods of recovering the bye-products of the distillation of coal is almost entirely German. Take, for example, the direct-recovery processes for tar and ammonia, and the recovery of crude benzol and the production of refined benzol. Then the newer processes of Feld and Burkheiser are German; and although these are not yet commercially established on a sound footing, they represent a distinct step forward. If we are to shake off this dependence on foreign processes, encouragement must be given to research at home. Research costs money, and a young enthusiastic worker cannot live on hope alone. In Germany his hope would have been fostered and fed, and money spent in the hope of ultimately getting a satisfactory result. Too often in this country we find that the result must be cut and dried before money is paid, with the consequence that young workers only become discouraged, and, on account of financial embarrasment, have to give up their investigations.

There is undoubtedly a great opportunity offered at the present juncture to British manufacturers, and they should not be slow to take advantage of it. At the bottom of it all lies the fact that scientific methods must be recognized, and that any business in which Science can play a part can only be worked to the best advantage if that science is allowed to have joint control, and, at any rate, to direct the operations of the works into scientific channels.

THE BRITISH ASSOCIATION AND GASEOUS EXPLOSIONS.

Seventh Report of the Committee.

In the Engineering Section of the British Association, at the Australian meeting, the Committee on Gaseous Explosions presented their seventh report. It dealt specially with the problem of directly measuring the temperature of the working agent in the cylinder of a gas-engine, while the engine is running under ordinary conditions.

In a method devised by Professors Callendar and Dalby, the thermometer, consisting of a piece of platinum wire about 0·7 inch long and 0·001 inch diameter, is placed in a thermometer valve which is inserted centrally in the admission-valve of the engine. The thermometer valve is worked by a cam on the lay-shaft so designed that during the explosion period it is closed and the thermometer therefore screened from the action of the gas. When the thermometer is exposed in the cylinder and connected to the Wheatstone bridge and galvanometer on which the indications are received, the circuit is made by a contact maker on the crank-shaft when the crank passes through an assigned angle, and is broken when the crank passes through a second assigned angle a little greater than the first, so that the electrical measuring device is in operation 5°, 10°, or 15°, as the case may be. The contact maker is a very important part of the equipment, as it enables a definite make and break to be made in the electrical circuit, and allows the time between the make and break to be adjusted with accuracy. The arrangement permits the temperature to be found at one point in the cycle, and then that at any other point can be calculated by using the charge itself as the thermometric agent.

A second method is by means of a thermocouple. Professor Coker and Mr. W. A. Scoble found that the alloys of platinum with rhodium and iridium respectively would withstand the temperature of explosion near the walls of the cylinder for some hours or even days if made into thermocouples 0·0005 inch to 0·0008 inch thick, provided the engine is not overloaded. The measurement is made by observing the change in the electromotive force of the couple; and this can be determined with great accuracy on the bridge employed.

The Lost Pressure in Gaseous Explosions.

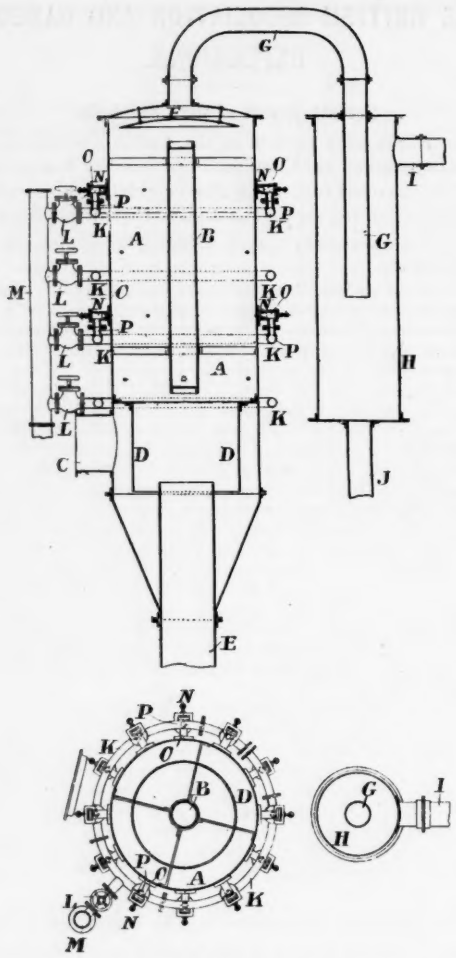
This was the title of a paper submitted by Professor W. M. Thornton. He said that when the maximum pressure of an explosion is calculated from the heat of combustion of the elements of the gaseous mixtures, values are obtained which are in all cases about twice those found by experiment; and the mean of a large number of "efficiencies of explosion" for different combustible gases approaches one-half. To account for this, four chief suggestions have been made: (1) That there is dissociation of the products of combustion; (2) that the specific heats are much higher at explosion temperatures; (3) that the products are rapidly cooled by radiation to the walls of the vessel; (4) that the combustion is not complete at the time of reaching the maximum pressure. Not one of these is in itself sufficient to account for all the loss of pressure. The suggestion the author makes is that it may be caused by the forces of cohesion which come suddenly into play at the moment of formation of a molecule, check the translational energy to which alone pressure and temperature are due, and raise for the moment the rotational energy of the combining bodies. The ratio of the translational energy of two colliding and cohering bodies before and after collision is one-half; and this ratio is to be expected for the whole mixture.

CONDENSING STEAM AND WASHING GAS.

A process which can be employed both for condensing steam and washing gas has been devised by M. Vladimir Goutière; and he has taken out a French patent [No. 452,038] for it and for the plant by which it can be applied. The nature of both is explained in the following particulars translated from the specification.

The steam to be condensed or the gas to be washed is run through an enclosed space, on the circumference of which there are atomizers throwing off a fine spray of water which fills the space and flows away in the opposite direction to the steam or gas. To make the description as clear as possible, an example is given, in the illustrations next page, of plant suitable for the application of the process—fig. 1 an elevation, and fig. 2 a section.

The plant consists of a metal cylinder A, preferably of sheet or cast iron, inside which there is a central pipe B fixed with cross-pieces, and closed at both ends. In the lower part of the cylinder there are one or more nozzles C for the admission of the steam or gas, and also a circular plate D; the cylinder ending in a cone which receives the discharge-pipe E. The upper end of the cylinder is closed by a lid F provided with a pipe G leading into another cylinder H, which acts as a safety vessel for the entrained water, and is furnished on one side with a discharge-pipe I and at



the bottom with another J. All round the cylinder A there are circular pipes or iron channels K, communicating through the valves L with a general water-distributing pipe M. The atomizers N are placed on these pipes. Each one consists of a body O, preferably of cast iron, with a lateral pipe P and a lid retained by a stirrup-iron. Screwed to the inside of the body is a bronze nozzle perforated with an opening, the diameter of which depends upon the quantity of water utilized.

The plant works as follows: The steam or gas, drawn in by the pump I, is sent by the pipe C into the circular compartment D; passes under it and ascends as far as the pipe G; meeting in its passage a shower of water, the coldness of which gradually increases. This water is discharged through the pipe E, which acts as a barometric tube. Condensation of steam or washing of gas is thus effected systematically and against the current, so that the cost for water can be reduced to a minimum. The atomizers are so arranged as to completely fill with spray the interior of the cylinder A. Atomization of the water can, besides, be obtained in several different ways. The apparatus will give a much greater quantity of condensed steam or washed gas simply by the addition of a row of atomizers. Its working only involves a small amount of water. There is no need to stop the plant for cleaning; and the complete absence of baffles minimizes resistance to the passage of steam or gas.

Inflammability of Mixtures of Methane and Gases.—Reference was made in the "JOURNAL" for the 11th inst. (p. 326) to some investigations carried out by M. Leprince-Ringuet on the limits of inflammability of methane, the results of which were communicated to the "Comptes Rendus" of the French Academy of Sciences [No. 158; 1914]. The author determined the upper and lower limits of inflammability for mixtures containing methane and oxygen in the constant proportions $CH_4 + 2O_2$, and also varying amounts of nitrogen, carbon dioxide, and water vapour. The investigations are briefly summarized in the current number of the "Journal of the Society of Chemical Industry." It appears that the effect of added nitrogen was to lower the upper and raise the lower limit of inflammability until the two coincided at a point corresponding to the composition: $(CH_4 + 2O_2)$, 20·1 per cent.; N_2, 79·9 per cent. The effect of carbon dioxide was similar, but of different magnitude; 0·56 volume of carbon dioxide having an effect approximately equal to that of 1 volume of nitrogen. The effect of water vapour could also be represented in a similar manner; so that if the mixture, temperature, and humidity were known, all necessary facts as to the inflammability could be deduced from a single diagram.

ILLUMINATION OF FACTORIES AND PLANT.

Good Lighting and the Prevention of Accidents.

At a Meeting of the New York Section of the American Illuminating Engineering Society, a paper on "Illumination as a Safety Factor in Industrial Plants" was read by Mr. R. E. Simpson. It is given, with some communicated remarks upon it, in No. 5, Vol. IX., of the Society's "Transactions," from which the following extracts have been made.

From time to time we read in the Technical Press that 500,000 avoidable accidents occur in the United States every year, and that of this number approximately 25 per cent. are due, directly or indirectly, to inadequate illumination or else improperly placed lighting units. To get proof of this statement in the form of statistics is almost impossible. Reports are issued annually by the labour bureaux of various States, and by the Federal Government, containing tables giving the number and causes of various classes of accidents. The causes that are listed include the breaking of hoists, cranes, winches, and other machines, the bursting of grindstones and emery wheels, the improper use of circular saws, lathes, and presses, contact with mill-gearing (shafts, pulleys, and belts), and persons falling or being struck by falling tools or some other objects. Rarely, if ever, is poor illumination among the list of causes, though many of the reports mention it as an indirect or contributory cause. The paucity of statistics on the relation of illumination to accidents is responsible, in a measure, for the apathy of factory owners and managers towards their lighting conditions. A manager, upon noting that such and such a number of workmen were injured by unguarded gears, at a cost to the employer of so many dollars paid to the injured employee in the way of compensation or in settlement of damage claims, is often led to see that his mill has adequate protective devices. But there is very little chance of his attention being directed to his lighting conditions by the statistics; and if it is true that 25 per cent. of the avoidable accidents are due to inadequate illumination, he is clearly overlooking an exceedingly important item.

The following incident, which recently came to the writer's attention, illustrates the evils of "spotted illumination" and the danger to workmen if one of their number is afflicted with retinal asthenopia or temporary blindness, and shows how easy it is to overlook the real cause of an accident. Two men were at work in a shop lighted by electric incandescent lamps, equipped with obsolete tin reflectors suspended close to the work. The upper zone of the shop was in semi-darkness—a condition which became more pronounced to the workmen as they looked up from their work. Some sections of the machinery and floor were brightly lighted, while others were dim. In going to another part of the shop, one of the men stumbled over a casting that was lying on the floor, and in an effort to save himself from falling he blindly put his hand on a belt-shifting rod which controlled the machine of another workman in the next row. This action threw over the belt and started the other machine. Fortunately no injury resulted, as the second workman had just finished a piece of work, and was engaged at the time in selecting another piece to put in his machine. It can readily be seen that a serious accident might have happened if the second workman had been engaged in adjusting the work, as he would have been totally unprepared for the starting of the machine.

The two workmen had a wordy war—the first blaming the man who had left the casting on the floor, while the second accused the first of stupidity. Neither of them, apparently, considered the fact that the first workman was demanding an extraordinary performance from his eyes. There was marked difference in the reflecting values of the two parts of the castings on which he had been working. One part was highly polished and had a high coefficient of reflection, while the other part was a dull iron-grey having a low reflecting value. The man's eye muscles had been under constant strain in an effort to adjust the pupillary opening to the light-reflecting conditions—the opening remaining relatively small, however, so long as the eyes were focussed on the work. When he turned from his machine, his eyes were compelled to adjust themselves to the change from a brightly lighted field of view to a dimly lighted one; and inasmuch as the eye muscles do not enlarge the pupillary opening as quickly as they contract it, he was labouring, for a time, under a serious handicap. If the incident had had a serious ending, the newspapers would have reported it as due to a fellow-workman accidentally moving a belt-shifter, and thus starting-up his comrade's machine; but an impartial and well-informed jury would have given improper illumination as the cause.

To many persons this incident may seem trivial; and it would be so if it were an isolated case. There are hundreds of factories in America where the lighting conditions are similar to those that prevailed in the case just cited; and these conditions are responsible, in the aggregate, for thousands of what might be termed potential accidents. The stage is all set and ready, and the frequency of accidents, or freedom from them, is largely a matter of chance, with the odds greatly in favour of the accidents. A little attention to the lighting details in these factories would materially minimize the chance of accidents, and would therefore reduce the number of them.

From a safety standpoint, as well as from a general illuminating

engineering standpoint, intense local lighting, as the sole means of providing artificial illumination in a factory, is undesirable. A minimum of two-tenths of a foot-candle should be provided in all parts of a factory where a moderate degree of local illumination is required. In plants where fine tool-work is done, and fine bench operations are carried on, so that intense local lighting is required, the minimum for general lighting should be half a foot-candle. This minimum is also essential in a shop filled with moving machinery, especially if the men are required to go from one part of the shop to another in the performance of their duties. Sharp contrasts between the intense local illumination and the low general illumination increase the hazards, because the employees, on account of their inability to see clearly, are apt to trip over obstructions in their path, or become caught in the machines or belts.

It may seem to some that I am laying too much emphasis upon the subject of falls as a cause of accidents; but statistics show that this is not the case. The annual reports of the British Factory Inspectors show that for the year 1911 there were 379 fatal accidents caused by machinery moved by mechanical power, aga'nst 377 due to persons falling. The figures for 1912 are 382 and 419 respectively. Very few industries are exempt from accidents due to falls. They are most frequent in construction work and in shipbuilding, and in foundries and iron and steel rolling mills—industries in which poor illumination is notorious. Poor lighting on stairways and in passageways and aisles in shops is responsible for quite a fraction of these accidents. In many cases the working area in a shop is well lighted, while no provision whatever is made for lighting the stairways and passageways. There is no work done in these places, and for this reason it does not occur to the owner that they should be lighted. The steps of the stairways are generally dark-coloured and worn round at the edges—conditions which increase the hazard. Substantial rail-guards and stair-treads, and lighting units with proper reflectors, should be part of the equipment of every stairway.

During a recent inspection, the following conditions were noted: A 12-step stairway at one end of a room led from the basement to the first floor. The nearest lighting unit in the basement (an unshaded carbon lamp) was 35 feet from the foot of the stairs, and the nearest unit at the top was 20 feet away—a shadow being cast at the top by a post between this unit and the top step. An unguarded driving-belt, extending half-way over the stairs, ran parallel to the stairway at a height of 5 ft. 7 in. The belt was operated so that the turn on the under side ran down with the stairs. A person coming in contact with the belt would receive an impetus sufficient to hurl him to the bottom of the stairs, causing him serious or even fatal injury. The belt should have been equipped with a guard painted white; and adequate light should have been provided so that anyone could clearly see the guard and the steps. When this was pointed out to the manager, he agreed that these precautions should be taken, confessing at the same time that the danger had not occurred to him.

This brings out the point that making the general working conditions safer is often a matter of looking into the details of the lighting situation. The shop engineer and manager will generally give heed to the cost of installing, the cost of operation and maintenance, and the location of the lighting units, in the shop where work is performed; but the stairways and passageways, if considered at all, are provided with a lamp here and there, without due regard to the demands of safety.

Few of our large buildings have been erected without a certain number of the workmen being more or less seriously injured. We are all familiar with the appearance of a building under construction—the street protection, the piles of building material, the single-plank walks over the beam layers and the uneven and unfinished floors, and the gloomy appearance of the first floor in particular. Building material such as bricks, sand, and cement, must be taken by hand from the point of delivery into the building, and the foremen usually drive the men so that the delivery waggon and the materials brought by it will obstruct street traffic as little as possible. A very limited number of lighting units are installed, in a more or less haphazard way, and these are depended upon to light the working space and its numerous danger-points. When the building is finished and the dangerous places have been eliminated, the amount of illumination is increased many fold. This, of course, is not at all consistent. The lighting facilities should be just as good during construction as after. Workmen carrying building materials are continually going from the bright daylight into the poorly lighted building, where they are unable to see their way clearly because of the great contrast in the lighting conditions; and this, together with the uncertain footing, greatly increases the hazards of their work, and is directly responsible for many accidents.

A great deal has been written and said in recent years respecting the merits, especially in the way of efficiency, of various kinds of lighting units. Salesmen have besieged factory owners and managers, the daily press and technical journals have been flooded with advertising literature, and bulletins have been spread broadcast, all for the purpose of bringing about a substitution of the more efficient units for the old inefficient ones. The success of these campaigns is attested by the remarkable increase in the sales of the tungsten filament lamps, at the expense of the carbon and gem filament lamps. It is true that the introduction of the tungsten filament lamp has increased the degree of illumination in factories, and is an important item in the conservation of our resources; but I am of opinion that it is equally true that the introduction of this lamp is the largest single factor for the increase of accidents in our industries during the period of artificial lighting.

The factory managers have gradually recognized the saving effected by the use of tungsten filament lamps. They have purchased them in large quantities, and have fatuously believed that by simply unscrewing a carbon or gem lamp from the socket, and replacing it with a tungsten filament lamp of higher candle power, of greater brilliancy, but consuming less energy, they have bettered the working conditions of their employees, and make a certain saving in their lighting bill at the same time. If the old lamp had a shallow, obsolete reflector, this reflector was left in place—not even the dust and dirt on it being disturbed. If no reflectors were in use, new up-to-date ones were seldom purchased at the time of the change in lamps. The manager noted the reduced lighting bill, and may or may not have noted the increase in the number of accidents. Assuming that he did consider this item, an admonitory notice recommending more care and vigilance may have been issued, and not much thought given as to the cause of the increase in accidents.

It is well known among engineers that the rays of light coming directly from a light source into the eye reduce the efficiency of the eye as a piece of visual apparatus. It is axiomatic that if a man cannot see his danger he is more apt to be injured than he would be if the danger were evident. An unshaded carbon filament lamp, directly in the line of vision, has a certain deleterious effect on the workman's rate of production and on his safety; and if for this carbon filament lamp a tungsten filament lamp with an intrinsic brilliancy two or three times as great be substituted, a slight increase in the quality and quantity of product may be evident, but this is gained at a considerable reduction in the factor of safety.

A 100-mile journey along a trunk line through a thickly settled territory would make a vivid impression on a person acquainted with the principles of illumination. The factories along the right of way give the impression of being well lighted; and so they are, if judged by the aggregate candle power emitted by the light sources. A close observer would, however, note that many of the principles of good illumination are violated. There seems to be a decided lack of attention paid to the details of mounting-height, spacing, and reflector equipment, all of which have an important relation to the effective illumination.

Just prior to an inspection, the superintendent told the writer that his mill was well lighted, and several times during our walk through the mill he complimented himself on the good illumination. There was one tungsten filament lamp, 150-watt size, suspended 7 ft. 6 in. from the floor in one part of the room, just in front of a cutting-machine. It was a clear lamp, and the only one in the entire establishment with the dignity of a reflector; the reflector in this case consisting of a shallow piece of opal glass, 6 inches in diameter. The rest of the lighting equipment consisted of 16-candle and 32-candle carbon lamps without reflectors, a few of them suspended 7 feet, but most of them from 5 to 6 feet, from the floor. It required less than five minutes' conversation in the superintendent's office to show him the waste in using carbon lamps, and the greater safety and comfort of the employees and better lighted working space from tungsten lamps equipped with modern reflectors and with the whole unit properly placed.

There is a crying need for greater concentration of efforts for the protection of the ultimate consumer of light—the eyes. Engineers and chemists have evolved lighting units which, if properly applied, will produce adequate illumination in our factories at a cost so slight that it is all out of proportion to its importance. The real problem seems to be the scarcity of men who are qualified to deal with the subject, and who can devote their time to it. There is a field for many times more men than are now available. The "Safety First" movement, and the recently enacted compensation laws, are creating a demand for expert advice on all matters pertaining to safety and sanitation; and the subject of proper lighting is bound to receive greater attention from factory owners than heretofore. It is here that the services of the illuminating engineer will be in demand; and in dealing with the problems, he should bear in mind that one of the principal safeguards for any workman is unimpaired vision.

The following remarks on the paper were communicated:

Mr. G. H. Stickney: Mr. Simpson has treated the subject principally from the standpoint of accident prevention. In its broadest interpretation, safety includes the preservation of health. Proper lighting is important in this connection for the conservation of eyesight. There are many processes of manufacture in which the eyes are required to give close attention to fine detail in order to ensure good workmanship. This is true of lace making and various other processes in the working of textiles, as well as the finer working of nearly all materials. Office work also usually demands close application of the eyes. Improper lighting induces eyestrain, which not only temporarily interferes with the efficiency of operators, but often results in permanent injury, which may disqualify them for the work for which they are especially trained and may otherwise be particularly adapted. From my own inspection of factory lighting, it has been evident that the fault has not always been lack of intensity; excessive glare and improper direction of the light are common defects. Nor are these defects limited to artificial light; they are common to daylight. Complaints are more common with artificial light because the possibility of correction is more obvious. Many times the correction

takes the form of simply increasing the intensity, when better direction and diffusion are really more essential. On the other hand, artificial lighting intensities are much lower than those common in daylight. If the light is properly diffused, excessive intensity scarcely ever occurs in artificial lighting, excepting from the standpoint of cost of illumination. Mr. Simpson mentioned half a foot-candle as the minimum intensity allowable in a workroom. This seems to be a good average figure, though it is subject to considerable variation, depending upon whether surfaces are light or dark, as well as upon other conditions. In a large ironfoundry where we made a study to determine the minimum intensity permissible for safety in moving round, we decided upon a value of one foot-candle. This higher value was due to the dark, non-reflecting surfaces, and the presence of dangerous conditions. As mentioned by Mr. Simpson, a few years ago the steel-mills were especially dangerous on account of inadequate lighting. However, since the Association of Iron and Steel Electrical Engineers has been actively interested in illumination, these conditions have been greatly improved. A remarkable reduction in the number of accidents is shown by actual figures taken over a period of years. I believe that no other industry has shown a greater improvement in this respect than the larger steel-mills. I am heartily in sympathy with Mr. Simpson's criticism of bad practice in using tungsten filament lamps, and believe that all interested in the manufacture of incandescent lamps are anxious to see them used with proper reflectors. On the other hand, I do not believe that the substitution of higher-power tungsten lamps for lower-power carbon lamps usually makes poorer lighting conditions.

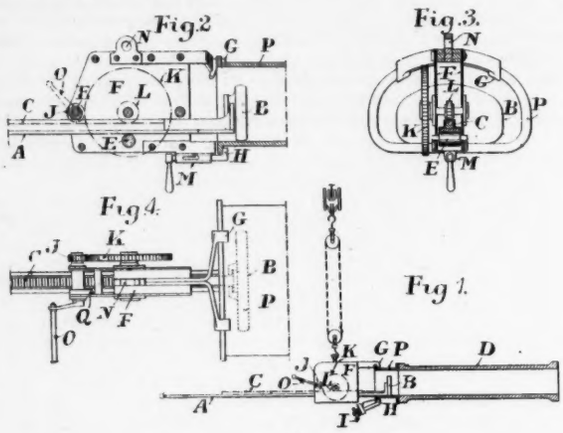
Mr. A. O. Dicker: It is decidedly encouraging to see that increasing attention is being paid to lighting as a means of preventing accidents. However, many owners and managers, realizing that their factory needs more light, unless coached in their lighting installation, are apt to go to the other extreme, and use too much light, not appreciating that they incur an equally dangerous condition. The placing of guard-rails round the danger-points, encasing gears, &c., is undoubtedly necessary; but the provision of sufficient light, so that the operator can see these points, is still more necessary. A man will not put his hand or foot on a danger-point if he can see it. A guard-rail round a hole in the street is not considered sufficient; a light so that it can be seen at a distance must also be used.

Mr. Clarence E. Clewell: Mr. Simpson has presented an interesting and important phase of factory lighting. The example of the workmen stumbling in the dark, and by accident grasping the belt-shifting rod of another man's machine to prevent a fall, is an excellent illustration of how shop accidents sometimes happen. The author advances the value of two-tenths of a foot-candle as the minimum in all parts of a factory where a moderate degree of local illumination is required, and a minimum of half a foot-candle for general illumination in cases where intense local illumination is required. He also condemns sharp contrasts between intense local and low general illumination as an effect calculated to increase accident hazard. This would seem to emphasize adequate general illumination and the elimination of individual lamps as an advantage from the accident-prevention standpoint; and the writer's experience seems to confirm this view. The lighting of passageways and stairs is a matter apt to be overlooked; and, as the author states, this condition is responsible for many accidents. The laws in Wisconsin and New York States require that such places should be adequately illuminated; and this feature of shop lighting may well be observed by all concerned. The author makes an interesting statement to the effect that, in his opinion, the introduction of tungsten filament lamps is the largest single factor for the increase of accidents in our industries during the period of artificial lighting. A similar contention by others that eye trouble had been greatly increased since the introduction of tungsten lamps, makes it clear that the application of engineering methods to the use of electric lamps is important to-day as probably never before. Information should be spread broadcast among factory owners and managers calling attention to the fallacy of replacing old carbon filament lamps by tungsten units, unless due care is given to the re-arrangement of outlets and the use of suitable reflectors.

DRAWING-MACHINE FOR HORIZONTAL GAS-RETORTS.

In large gas-works, where the horizontal retorts are 20 feet in length, pushers are employed to discharge the coke at the end of the period of distillation. These pushers are mounted on trucks running along the ground. M. Auburtin has taken out a French patent [No. 451,636] for an appliance for small and medium-sized works, where 10-feet retorts are in use, to effect the same object. It is of a simple and inexpensive type, and can be easily worked by hand. It consists of a pusher-bar, on the handle of which there is a rack. It is guided in a cage hooked on to the head of the retort, and has gearing of which the pinion is worked by a crank, while another pinion gears with the rack of the pusher. The cage is suspended by tackle running on a rail parallel with the front of the retort-bench. When the machine is fixed to the head of the retort, all that is required is to turn the crank so as to make the pusher enter.

An example of the construction of the appliance is shown in the accompanying diagrams. Fig. 1 is an elevation of the machine (the retort being shown in section); figs. 2 and 3 are side and front elevations of the cage and part of the pusher; and fig. 4 is a plan corresponding to fig. 2.



The pusher consists of a rod A, at one end of which there is a handle in the form of a T; the other extremity being fitted, in a way to allow of its being removable, to a pusher B. On part of the rod there is a rack C, of the same length as the retort D. The rod is guided between the rollers E through a cage F, which is attached to the front of the retort by means of clips or suitable hooks G H. The former are fixed rigidly to the cage; whereas the latter are connected either by means of a hinged fork which can oscillate round an axis, a fixed socket in which it can slide and turn like a bolt, or in any way which will allow the end of the hook to be released from the edge of the retort. Locking can be effected either by means of a nut and fly-wheel, as at I in fig. 1, or in any other manner.

The shafts of the toothed wheels J, K, L are mounted in the cage. The number of these wheels may vary. The shaft of one of them is provided with a crank M, while another wheel gears with the rack C. This gear is such that the stress exerted upon the crank by a man will easily drive the pusher forward, notwithstanding the resistance presented by the coke. At the top of the cage there is an eye N, by which it can be suspended to trolley tackle running upon a rail (as shown in fig. 1), or other type of track.

The working of the machine is as follows: Being suspended by the tackle, one man stands near the working chain and the crank O. He attends to the working of the hook or bolt H, as well as to the opening and closing of the retort-lids; while another holds the handle of the pusher. The lid of the retort to be emptied having been removed, and the pusher brought to the front of the retort, the first workman adjusts its height, and the second, by pressure upon the handle, makes the pusher turn in such a way that the clips G will be fixed on the upper edge of the front of the retort. The first workman now brings the bolt H forward, and makes it turn so as to fasten the machine on to the lower part of the retort head P. Then by turning the crank O he will drive the pusher forward against the mass of coke, until the retort is empty, just as is done by the drawing-machines employed for large settings. During this operation, the second workman, still holding the handle of the pusher, guides it and moves forward with it. The retort being completely drawn, the first workman releases the retaining-wheel Q, and the second moves backward, pulling the pusher towards him. This allows of a rapid return of the machine. The first workman releases the bolt H, and pulls it backwards; and the other workman, by pressing the pusher handle, disengages the clips G from the head of the retort. The work is then finished, and the pusher has only to be moved for drawing the next retort.

Venturi meters used by the Metropolitan Water-Works, which supply eighteen municipalities in the vicinity of Boston, numbered 71 during the year 1913. There were also three disc meters, one torrent meter, and five detector meters of the Hersey type used in measuring small quantities which cannot be conveniently measured with meters of the Venturi type. The work of looking after the meters in the Metropolitan district was done by two men, assisted at times by a third.

We have received from Messrs. Bemrose and Sons, Limited, of Midland Place, Derby, a copy of the fifth issue (1914) of the "Year-Book of the Birmingham Chamber of Commerce," which is officially issued in the interests of the trade and commerce of Birmingham and the Midlands. Its object is to supply traders in all parts of the world with brief particulars of the manifold industrial resources of this area; and it is thought that its circulation at the present time should be more than ordinarily useful, in recovering trade lost to Germany. In addition to the local information, the book contains a large number of facts and figures useful to all commercial men. Needless to add, its "get up" is excellent in every way.

BISCUIT MAKING WITH GAS.

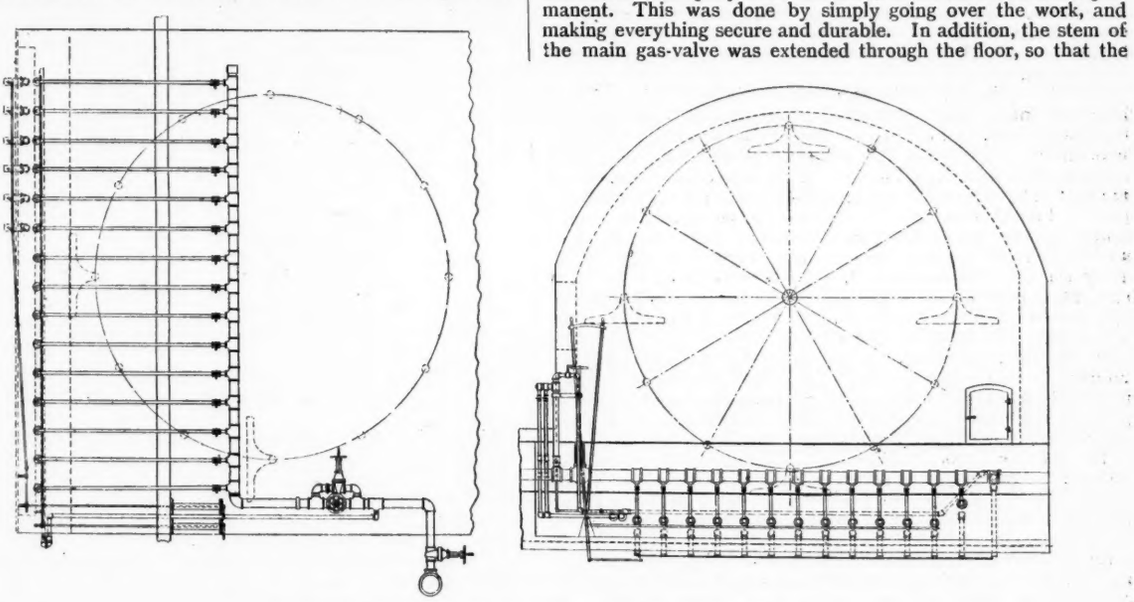
At the Mid-Year Conference of the Industrial Fuel Committee of the American Commercial Gas Association, Mr. H. E. WATSON, of the Consumers' Gas Company of Toronto, read a paper entitled "An Experiment in Biscuit Making with Gas." It was as follows.

Having reason for believing that a large biscuit-manufacturing company in Toronto would be glad to adopt gas as fuel in reel ovens, providing the cost of operation would not be prohibitive, we tried to learn if gas was being used for this purpose in any other city, but without result. The only information we could get was that one gas company had put in a trial installation which did not stay; so we were thrown upon our own resources.

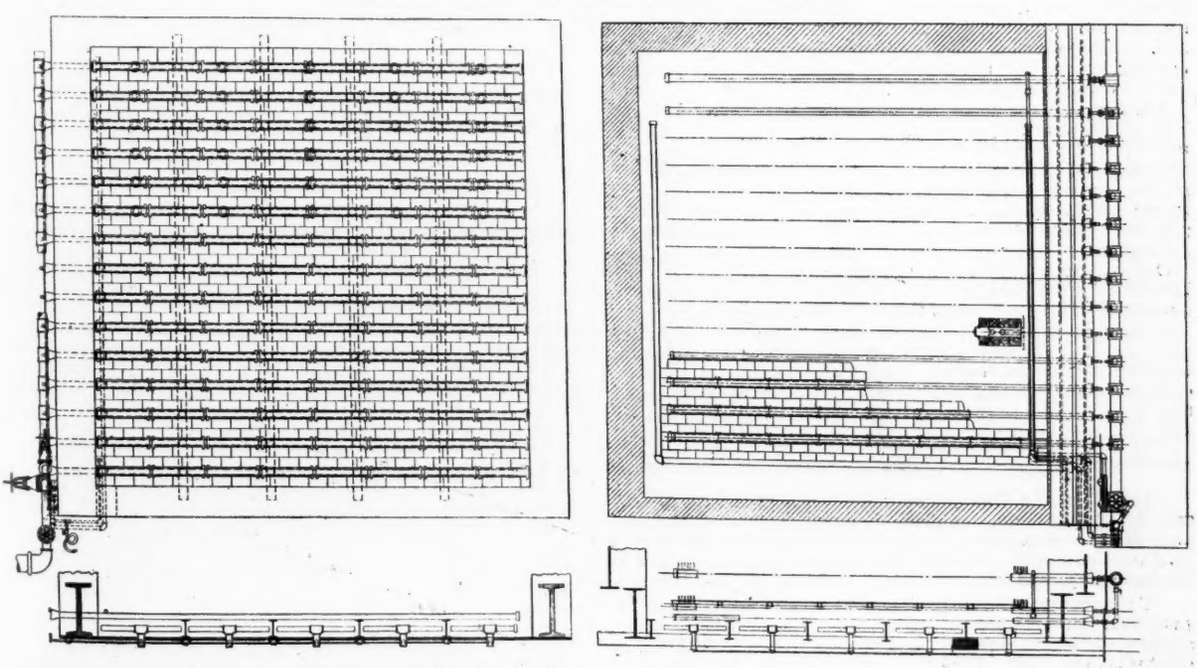
An arrangement was made with the biscuit company to put a trial installation in the smallest oven—the Consumers' Company to bear the expense, except for the gas used. This was done, as follows: The fire-box and space under the reel were filled with ashes and levelled to within about 2 feet of the shelves in their lowest position. To supply secondary air, horizontal brick flues were laid parallel with the front of the oven, connecting with the outer air by 4-inch pipes run through the walls of the oven. About two-thirds of the way up from the bottom of each flue was placed a strip of sheet iron perforated with 1-inch round holes. On this was laid a flat piece of thin steel plate, perforated to register with the strip below. The movement of these plates backwards and forwards by means of small bars passing through the walls was intended to regulate the amount of secondary air. The only bad thing about this idea was that it did not work. In actual practice we found that leakage alone was almost enough to give all the air required. Just above these slides were placed some atmospheric burners of 2-inch pipe, with double rows of 3-32nd inch holes. On each side of the burner a strip of sheet iron projected from the walls of the flue to within about ¼ inch of the burner holes. This was to direct the secondary air close to the flames. Cast-iron baffles were laid on the brickwork 3 inches above the burners, in order to make them light more easily, and to keep out dirt.

The oven was supplied with gas from about a 300-feet run of 4-inch pipe which had originally been put in to supply a gas-engine. This did not give sufficient pressure at the maximum consumption of the burners; but, from fear of inconveniencing building operations at this point, the pipe was not changed, but, instead, a small booster, giving with no load about a 6-inch pressure at the oven manifold, was inserted. The oven was then heated for two days to warm-up the brickwork, and a trial of baking made. It was successful from the first—not that everything was perfect, but only minor troubles were encountered.

The maximum consumption on this oven was 3500 cubic feet per hour; this quantity being used for twenty to thirty minutes to warm up, first thing in the morning. The rest of the day about 2200 cubic feet were found sufficient. The daily average consumption was about 22,000 cubic feet, compared with 1700 lbs. of hard coal. The dimensions of the oven were: Width, 12 feet; depth, 15 ft. 9 in.; height, 21 feet; and its capacity for baking soda biscuits was five barrels of dough per hour. The water-evaporating efficiency with gas was about 50 per cent. At the comparative prices of coal and gas which we figured upon, the fuel cost with gas was about 100 per cent. higher than with coal. This was considered satisfactory by the biscuit company; so the Consumers' Company were ordered to make the installation permanent. This was done by simply going over the work, and making everything secure and durable. In addition, the stem of the main gas-valve was extended through the floor, so that the



FRONT AND BACK ELEVATIONS OF THE BAKE-OVEN.



SECTIONAL VIEW AND PLAN OF THE OVEN.

baker could regulate the consumption of gas without having to go downstairs.

The next order was to equip the largest oven, which had these dimensions: Width, 16 ft. 7 in.; depth, 16 ft. 5 in.; height, 21 feet. This was done about the same way as the first one, with the exception that, in addition to gas regulation being provided for on the baking floor, arrangements were made to regulate both the primary and secondary air. Also the perforated strip idea of controlling the secondary air was abandoned, and dampers were placed on the ends of the flues outside the oven. The two rear burners were elevated somewhat, and the consumption on them greatly increased; one being made of 4-inch pipe with four rows of holes. This was intended to give greater top heat in the oven without increasing the consumption on all the burners.

To be perfectly frank, considerably more difficulty was experienced in pleasing the biscuit company with this installation than with the former one, as by this time the first flush of enthusiasm had disappeared, and a somewhat more critical disposition was apparent. However, we finally got it to suit them; and these two ovens have been running for several months, giving, as far as we can learn, satisfaction. The most pleasing thing from our standpoint is that in slack times we find the gas-heated ovens are used and the coal-fired ones left idle.

Our customer then decided to equip the whole plant for gas. This, of course, must be done gradually, so as not to interfere with the business. The company are putting up a large six-storey addition to the plant, which will have six ovens on the top floor. These ovens are now built. The equipment of them will be the most modern in every respect, no expense whatever being spared. They are constructed to use gas exclusively, and coal could not be burnt in them without the expenditure of thousands of dollars for alterations. In five of them the gas work has been partly done; the sixth is now ready for operation. The four remaining coal-burning ovens will not be converted to gas until the new plant is in operation.

The gas equipment of the new ovens we believe to be quite an improvement, as nearly everything can be seen and operated from the baking floor. Of course, the burners have to be considerably lower than the floor; but this has been provided for by having the manifold, mixers, &c., in a pit at the side of the oven. They are lighted by means of a pilot; being started and regulated from the usual position occupied by the baker in charge. The regulation of both the primary and secondary air is done from the same position. There are also two side burners operated at this point. They are very seldom required, but are there in case the oven should be a little uneven in heating. Provision is made for controlling the heat from side to side, front to back, and top and bottom. The oven is also equipped with a 4-inch vertical rotary meter, in order to check the baker. A pressure-gauge is placed upon the burner side of the main valve. The baker watches this and a pyrometer beside it. After a little experience, he soon learns what pressure is needed to give the required temperature. The maximum consumption of the oven is about 5000 cubic feet.

The six new ovens are placed in two groups of three, each of which is supplied from a 6-inch riser and a 6-inch service. An 8-inch service and riser have been laid to supply the six old coal-burning ovens. It has not so far been thought wise to instal any governors.

As the new factory was started before it was decided to use gas, no provision was made for a meter-room; so this made somewhat of a problem. But two small spaces were finally secured. An English manufacturer made for this installation eleven meters of increased capacity. Their diaphragms are the same as ordinary 250-light meters, with valves and channels equal to the 500-light size. Under actual test they pass at 3-inch pressure, 5000 cubic feet per hour with a 1-inch drop. Gas is sold to the company according to the regular schedule.

The disadvantage of gas for biscuit baking is higher fuel cost. The advantages of its use are: (1) Absence of any trouble with fuel supply, (2) no machinery or labour required for handling coal and ashes, (3) less labour, (4) less heat and discomfort for the employees, (5) less spoiled material, (6) less floor space required, (7) increased cleanliness, (8) faster work, and (9) a more uniform product. These advantages certainly more than counterbalance an increased cost for fuel.

Our experience has shown us that the fuel bill can be easily increased 50 per cent. by a little carelessness in installation or operation. The great points I would emphasize are that for an installation of this kind the secondary air must be cut to a minimum, and the gas pressure must be good. The maximum capacity of the burners should be about double the average consumption, in order to flash-on the heat in the morning. Though it would appear that a successful installation has been made, we believe there is still a chance to make a considerable improvement in economy.

The Executive Committee for the Ninth International Congress of Applied Chemistry have issued a preliminary announcement of the meetings next year. The Congress is to be held at St. Petersburg from Aug. 8 to Aug. 14, under the presidency of Professor P. J. Walden.

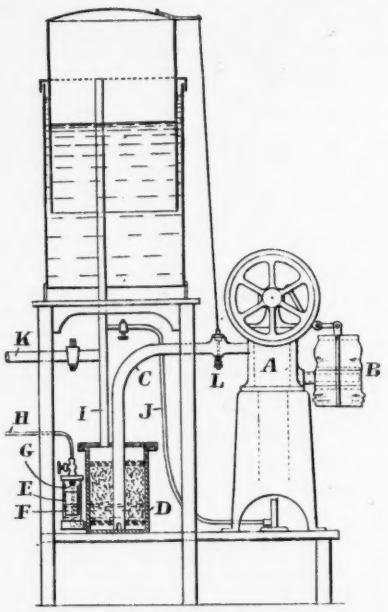
To improve the lasting qualities of catalytic substances used in gas-lights, Mr. G. Meyer, of Auburn, N.Y., U.S.A., has invented an appliance in which the catalytic member is enclosed until the instant it is to be used. Then it is exposed to the catalytic action for as short a period as possible, after which it is housed again.

GAS PRODUCTION FROM HYDROCARBONS.

M. Achille Laurent has taken out a patent for France [No. 452,487] for a process for the manufacture of gas suitable for domestic lighting and heating purposes from hydrocarbons such as benzol, naphtha, gasoline, &c. The following particulars are translated from the specification.

The plant differs from others now in existence from the fact that it is driven by a motor that pumps air into a special saturator in which the air is charged with hydrocarbon; the air being previously heated by running through the cooling jacket of the motor. The combustible mixture thus produced passes into a gasholder the contents of which are utilized both for the engine and the purposes stated.

In the accompanying illustration an example is given which represents, partly in elevation and partly in section, a form of construction of the apparatus.



The engine A is driven by hot air, and works a blower B, which sends air through the pipe C running to the lower part of a saturator D, consisting of a cast-iron vessel with an air-tight lid. The air from the blower, after passing through the cooling jacket of the motor, flows, on reaching the saturator, through several screens formed of perforated iron plates and wire gauze, as well as a certain thickness of sponge. The saturator is soaked with hydrocarbon, the level of which is maintained constant by a float E, in a transparent vessel F, which, with its needle-valve G, closes and opens the hydrocarbon intake-pipe H. The hot air passing through the saturator is charged with the hydrocarbon vapours, and passes through the pipe I into the gasholder or to the place of use.

Two pipes, J K, are connected to the pipe I. The former feeds the engine; the latter is a pipe having branches to the plant to be supplied. The bell of the holder is united, by a wire rope or similar means, to a valve L on the pipe C supplying air to the saturator. When this valve is open, the air from the blower escapes into the atmosphere; the effect being to automatically proportion production and consumption.

In the course of the second part of his Inaugural Address at the last meeting of the British Association—the portion delivered at Sydney—Professor Bateson, F.R.S., made the following remarks: "The coming generations are determined to get more out of this world than their forefathers did. Is it then to be supposed that when science puts into their hand means for the alleviation of suffering immeasurable, and for making this world a happier place, they will demur to using these powers? The intenser struggle between communities is only now beginning, and with the approaching exhaustion of that capital of energy stored in the earth before man began, it must soon become still more fierce. In England some of our great-grandchildren will see the end of the easily accessible coal, and, failing some miraculous discovery of available energy, a wholesale reduction in population. There are races who have shown themselves able at a word to throw off all tradition, and take into their service every power that science has yet offered them. Can we expect that they, when they see how to rid themselves of the ever-increasing weight of a defective population, will hesitate? The time cannot be far distant when both individuals and communities will begin to think in terms of biological fact; and it behoves those who lead scientific thought to carefully consider whither action should lead."

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Monazite Sand from Travancore.

SIR,—With regard to the article by Mr. T. D. Asten in your issue of Aug. 18, entitled "Mantles and the War," which has been brought before our notice, and which we find full of inaccuracies, I am instructed by my Board to write to you as follows.

The Travancore Minerals Company, Limited, is a British Company, having a licence under the control of the Government of India, in accordance with which the Company is liable to pay a royalty on a minimum output of 1200 tons per annum.

The Travancore Minerals Company, Limited, is interested in the sale of monazite sand only, and has made a contract for the whole of its output with the only firm in Europe capable of taking such an output.

Up to the outbreak of war, no applications have reached the Company for supplies of monazite sand for this country—save one, and that applicant was supplied with all the sand that was asked for.

Since the outbreak of war, two further inquiries have reached the Company; and they have resulted in orders which are now being executed. We may say that we shall be only too pleased to receive further orders.

For and on behalf of the TRAVANCORE MINERALS CO., LTD.,
WM. A. LEO, Secretary.

4, *Charlotte Place, Brook Green, Hammersmith, W., Aug.* 26, 1914.

[We are sorry that the Travancore Minerals Company, Limited, has hitherto hidden its head in the way it has done. We do not even now notice the name of the Company in the Commercial Section of the "London Directory." No. 4, Charlotte Place, is not deemed worthy of notice in the Streets Section of the same Directory; but Brook Green is, and in Brook Green we see are situated the Osram Lamp Works. This, of course, is only a coincidence. To the best of our knowledge, no attempt was made, until the war came, and the British gas industry began a movement which it is hoped will provide it with an independent position in regard to nitrate of thorium, to advertise the fact that the Travancore Company were prepared to do business with anyone. As a matter of fact, we cannot see how they could have suggested doing business with anyone else, seeing that, as the above letter states, this purely British Company made a contract "for the *whole* of its output with the only firm in Europe capable of taking such an output." When people do not make the fact known that they are out to do business, then they are not likely to be asked for the commodity which, it now seems, it would give them so much pleasure to supply. They have denied themselves the pleasure of supplying before by not advertising the fact that they were willing to do so, and by hiding themselves. It may be there will be an opportunity of dispensing with the services of a company who have one contract running which monopolizes all its output. The one firm which has the monopoly of the Travancore Company's supply from India, let us suggest, is situated in Berlin; let us suggest, too, that it is the same German firm, or Company, to whom the Osram lamp patents belong; let us further suggest that the General Electric Company deal with the Osram lamp in this country; let us also point out that the Travancore Minerals Company, unless Somerset House deceives us, is a British Company with a parentage bearing the names of the London Cosmopolitan Mining Company, Limited, and the General Electric Company, and that three of the Directors of the Travancore Company were nominated by the General Electric Company. The names of the Directors are interesting, so are the financial arrangements, so is the list of shareholders of the old General Electric Company, and so is much else of a documentary character that people may inspect at Somerset House. Even the dusty records there show that commerce is not destitute of its romantic side. Let us not leave the subject without acknowledging how exceedingly thoughtful and kind it was of the General Electric Company towards the British gas industry, and of course nobody else, to interest themselves in monazite sands from which nitrate of thorium is made, and which is the main requirement of mantle makers—the German Auer Company among the number. By the way, no doubt quite as an oversight, the Travancore Minerals Company have omitted from their letter the particulars of the "inaccuracies" of which they allege Mr. Asten's little article in our columns (*ante*, p. 381) is full.—ED., J.G.L.]

In order not to have any delay in securing a reply from Mr. T. D. Asten to the letter of the Secretary to the Travancore Minerals Company, a copy was sent to him, and the following letter is the result:

SIR,—The letter of Mr. William A. Leo, Secretary to the Travancore Minerals Company, appears to be designed to confuse the issue. As you stated yourself, last week, "something which we want that comes from India is in the hands of the German Auer Company." As you will see from our article [*ante*, p. 381], the sand was originally handled by the London Cosmopolitan Mining Company; and it was only after the contract was fixed between these people and the "German financiers," that the Travancore Minerals Company was formed. The application referred to for the sand was naturally made at this stage to the London Cosmopolitan Mining Company, and was declined by their Mr. Jaeger.

Of course, we can understand that the Travancore Minerals Company would prefer to sell the whole of the output of sand to one Company; and it is unfortunate that the German Auer Company had made such inroads into the British mantle manufacturing business at this time (we think you will understand what we mean by this), that no British combination was sufficiently big to undertake the whole contract.

We do not suggest for a moment that the Travancore Minerals Company are not now, during the time of the war, willing to sell Travancore sand to any and all comers; the fact being, of course, that they are only too pleased to dispose of the sand which they cannot, on account of the war, ship to Germany.

What we wish to see, however, is a *definite contract* made with an English Company, for the supply to them, not only now *but after the war*, of a portion of the output of this rich bed of sand. Further, there was nothing to prevent the Travancore Minerals Company at any time from making another contract outside the one made with the Auer Company, inasmuch as the extent of the deposit appears to be almost unlimited.

For THE VOELKER LIGHTING CORPORATION, LTD.
THOMAS D. ASTEN,
Wandsworth, S.W., Aug. 29, 1914. Chairman.

British Mantles and Prices.

SIR,—We have read your esteemed "JOURNAL" since the war began with great interest, and we are struck with amazement at some of the articles appearing in it, more especially with the adoption of the anti-foreign policy that crept into many of the sentences.

Our business, like all factors and manufacturers of incandescent lighting goods, is composed of imported goods. Even the small percentage that is manufactured in this country, and possible of manufacture, is composed of ingredients which are either controlled by persons residing out of these islands or wholly monopolized by them; and as business has been very materially affected by the sudden stoppage of supplies from foreign countries, we naturally took an opportunity in writing to the six gas-mantle makers known to us in this country.

Gas-mantles, even in the most stressful times—though we cannot realize any worse than the present—represent a necessitous article to artificial lighting, which the human being will soon be unable to dispense with as the winter months proceed. We will not dwell upon the tragic scarcity of glassware, which is only possible of production abroad. Our chief purpose in writing to you is to touch upon the question of mantles.

We said we wrote to these gas mantle makers. Five out of the six replied very courteously that they were full up to cover the raw materials in their possession; and then we suppose they will do as others in the lighting business will be obliged to do—completely shut-down for want of these raw materials. There is clear and abundant evidence that these prized materials in this country could never cover the requirements of the coming winter. The sixth manufacturer promptly replied saying he would be prepared to supply mantles any size, shape, or description, other than high pressure, at £10 10s. per gross, in restrictive quantities, upon restrictive terms of trading.

Do not these facts disclose quite a different picture than had been painted in the columns of the "JOURNAL." And this £10 10s. offer is from one of the makers who had freely voiced his opinions in your columns.

For "PIFCO" LIMITED,
Manchester, Aug. 28, 1914. J. WEBBER.

[Rather pleased than otherwise are we that, in the circumstances, our correspondents have been struck with amazement at something that has appeared in our columns. We do not agree that a 40 per cent. production of mantles made in this country is a "small percentage," though at the same time we shall be pleased when, and shall not be particularly contented until, the mantle makers in this country move much nearer to the 100 per cent. goal. Our correspondents tell us something that has been one of the salient features of our articles the last two weeks, that mantles are "composed of ingredients *which are either controlled by persons residing out of these isles, or wholly monopolized by them.*" If our correspondents had read recent articles carefully, they would have observed that the points as to thorium "control" and "monopoly" have been very present in our minds through these eventful times, and the position has been assailed. It is hoped that one result will be to get better control of the main ingredients for this country, and not have them "bottled up" in the way they have been hitherto. It is our view that this country will in time enjoy a new freedom in this regard. But for current purposes, what are the materials upon which the mantle makers are dependent which cannot be secured in this country? Mr. Charles Carpenter, D.Sc., touched upon this matter in his letter last week; and really we are not among those who think that there will be any need for the British makers to shut-down. It is not our business to try to regulate the action of any British maker as to price to any firm whose business has hitherto been "*composed of imported goods*," and who promptly seeks refuge in the camp of the home makers when such a position as the present arises. Nor do we see that the fact of the high price quoted in any way affects any picture that has been painted in the "JOURNAL," though we do not quite know, nor are we much concerned to know, which picture is referred to. On their own admission, the position of Pifco Limited to-day supplies a very fine illustration of the necessity, in the interests of the gas industry, of greater protection of its requirements than has been the case. Pifco Limited is in the condition of wanting stock to-day, because the concern is cut

off from the base of its former supplies. This is a situation which we wish to see altered, and it will account for what our correspondents' fancy describes as the "anti-foreign" tone of certain sentences in our articles. "Self-preservation is the first law of Nature."—ED. J.G.L.]

City and Guilds Examinations and the War.

SIR,—I am herewith enclosing a copy of a notice in regard to the Institute's technological examinations which it has been considered advisable to issue in view of the present war. This notice has been sent to most of the Technical Colleges and Schools, and has been forwarded by the school authorities in many cases to the Local Press. It occurs to me that you may wish to have a copy for the purpose of mentioning it in your "JOURNAL" as a matter of interest to your readers.

PHILIP MAGNUS.

City and Guilds of London Institute, Exhibition Road, S.W., Aug. 28, 1914.

[ENCLOSURE.]

CITY AND GUILDS OF LONDON INSTITUTE—DEPARTMENT OF TECHNOLOGY.

NOTICE.

Students of technological classes and others preparing for any of the examinations of the Institute's Department of Technology will not, so far as possible, be prejudiced in competition for certificates and prizes, if they have been prevented from fulfilling the Institute's regulations as to attendance at classes or otherwise, by reason of their having joined the Military Forces of the Crown or having accepted temporary civil employment in connection with the defence of the country.

MORTON LATHAM, Chairman of the Technology Committee.

Exhibition Road, S.W., August, 1914.

Murdoch and Gas Lighting.

SIR,—In the year 1892, on the occasion of the "Centenary of Gas Lighting," I reprinted for private circulation, "A Letter to a Member of Parliament, from Mr. William Murdoch, in Vindication of his Character and Claims, in Reply to a Recent Publication. . . . (London, 1809.)" To it, I added a prefatory historical note. Copies were sent to the chief public libraries, to the leading gas managers, and to others whom I knew to be interested in the matter; and you were kind enough to notice the pamphlet in your issue for June 21, 1892. Since that time a new generation has arisen, among whom there may be some to whom Murdoch's claims are but little known. I have still a few copies left, and shall be very glad to send one to any of your readers if they will let me have their names and addresses on a post card.

R. B. PROSSER.

75, Dartmouth Park Road, London, N.W., Aug. 27, 1914.

Steel Pipes at Home and Abroad.

SIR,—The article on this subject in your issue of Aug. 11 reopens a controversy that cannot be ignored.

The advantages claimed by your correspondent for steel pipes commend them, doubtless, for many services—particularly for temporary work; but for endurance in works of permanent utility, is it either safe or economical to use steel pipes? Can your correspondent be quite ignorant of the eloquent facts regarding the important contracts recently made for the supply of cast-iron pipes to replace steel mains which have lamentably failed through the inroads of the arch enemy of all steel structures—viz., corrosion. The contracts were based upon the fact that cast-iron successfully defies corrosion—as witness Southwark Bridge, of which it is reported that although a hundred years old the cast ironwork is staunch, and practically unaffected by time.

Over 20,000 tons of cast-iron pipes are in course of being supplied to displace abandoned steel mains in Atlantic City, Troy City, and Rochester City, U.S.A.; the steel mains having, in scarcely fifteen years service, given inefficient and rapidly deteriorating use.

Your correspondent cited South Africa as a field for the special use of steel piping. This is particularly unfortunate; for, to go no further, Ladysmith, De Aar, and Port Elizabeth provides a trio where the effort to economize by using steel pipes because lower in price than the substantial but enduring cast-iron, has, as elsewhere, proved disastrous, and anything but comforting to the ratepayers. In all these South African cases, there has been, after trial on a large scale, wholesale condemnation of steel as utterly unsuitable, and as a consequence cast-iron pipes have been or are being substituted. The steel piping has not given efficient service for ten years.

Again, we take your "Scottish Correspondent's" example from Australia—the 350 miles of goldfields steel main. The Minister of Public Works in April last reported the anxiety of his Department [see speech herewith] on account of the increasing cost of maintenance, indicating that an expenditure of over £150,000 would be necessary to prevent the work, only eleven years old, going beyond repair. The corrosion is still proceeding, both externally and internally.

It is the internal corrosion that, in spite of the coating, is playing havoc with the Tay Bridge pipes.

Your "Scottish Correspondent's" communication, on careful perusal, reveals what indeed cannot really be concealed—that steel piping depends for its preservation (nay, its very life) upon the preservative coating and the extraordinary expedients indicated, and should create a disposition towards an exhaustive inquiry into the reasons for the inherent weakness that call for so much bandaging.

The conditions where piping is to be employed—conditions of soil and moisture, the quality of the water supply, the extreme susceptibility of steel to the ravages of rust, and the tendency to run into pitting and perforation—must all have full consideration; otherwise the unfortunate experience of Rochester and Port Elizabeth may—indeed, are certain to—be oft-repeated. These two illustrations have been quoted as proud examples of the application of steel to modern requirements. They have both proved very conclusively that the seeming saving is a great delusion, and that the final cost is not the first cost, but something very different; for both have involved the respective communities in an intolerable expenditure, which could all have been avoided if cast-iron pipes had been installed in the first instance.

It is scarcely two months since one of your contemporaries laconically reported regarding Hythe: "Cast-iron water-mains are to be substituted for those of steel at a cost of £900." On inquiry we were informed that the steel pipes which have failed by corrosion and perforation have not been in service for six years.

Set against this sad experience the statement on the very page containing the letter reviewed—namely, that the Lincoln water authorities are giving special regard to the fact that the cast-iron pipes lasted from thirty to forty years.

We are not denying the train loads and stocks; but as a wrong chart may lead to disaster, an insufficient and misinformed statement may possibly mislead your readers.

We must not trespass unduly on your space to traverse the whole ground opened up; but the "JOURNAL" is too important an organ to permit of an erroneous impression persisting; and so we venture to ask your hospitality for these lines.

HOLWELL IRON COMPANY, LTD.,
per THOS. SARSON, General Manager.

Asfordby, Leicestershire, Aug 22, 1914.

[ENCLOSURE.]

AUSTRALIAN GOLDFIELDS WATER SUPPLY, COOLGARDIE.

30-INCH STEEL WATER-SUPPLY MAIN.—NEW STORAGE TANK OPENED AT COOLGARDIE.

EXTRACT from a speech by Mr. W. D. Johnson, M.L.A., Minister for Works.

. . . In the original estimate, the life of the main was calculated at 21 years. It had already been in operation for about 11 years; but the advisers did not take into account the peculiar qualities of the Mundaring water, which, though of great excellence from the hygienic standpoint, had a very corrosive effect on the metal. Not many years had elapsed before the corrosion began to cause anxiety to the engineers. Measures for prevention were investigated by expert Government officers; and all the data collected were sent home to three of the foremost British experts on this subject. On receipt of their report, part was adopted by the Government. This consisted of lime treatment, and measures for keeping the pipes fully charged so as to try and exclude all air. This involved lime treatment plant, settling tanks, and several summit-tanks, at a cost of £36,000. This work was pushed by the present Government, and was finished a few months ago.

Although it was started by the present Government prior to the present summer, it became apparent that on the section from No. 2 pumping-station to the first summit-tank the incrustation of the pipes had reached such a stage as to cause considerable doubt whether the pump could force through sufficient water for goldfields requirements. On the recommendation of Mr. O'Brien, the Engineer, the Government decided to replace this section with new pipes. This had been done at a cost of £10,000. A satisfactory feature of this replacement was the fact that practically the whole of the pipes taken out could be effectively repaired, at a moderate cost, and re-used after recoating, &c.

Since his appointment Mr. O'Brien had given the closest possible personal attention to this important matter of corrosion. He had carefully watched the effect of the preventative measures already taken, and had given anxious consideration as to what further steps should be taken. He had just prepared a report which showed the importance and difficulty of the problem which the Government had to face. He pointed out that the corrosion was still proceeding, both externally and internally. External corrosion was met by removing the soil and preserving the coating. This necessitated expensive work in opening-up the main. Some 40 miles of it had already been opened; and the Engineer strongly recommended the opening of an additional 54 miles at a cost of £43,000.

Internal corrosion, however, was the cause of the greatest anxiety. The remedial works recently completed had checked but not entirely stopped it. Further lime treatment and summit-tanks were proposed; and the Engineer had recommended works in this connection, which he said should receive immediate attention and would cost £84,000.

He (Mr. Johnson) now proposed to turn to the financial side and give them further details. The Government found that the deficiency was accruing at the rate of £32,000 a year. This had to be met out of general State revenue; and the total deficit at June, 1913, was £936,000, which had been contributed by the general taxpayers. The Government might, in consideration of indirect benefits derived, view this with but little concern if it were not for certain attendant circumstances. The first of these he had already referred to—namely, the increasing cost of the maintenance of the 30-inch main. The second was a decided tendency to a decreasing revenue from water sales on the eastern fields.

Croydon and its Water Filtration Process.

SIR,—Upon p. 412 of your issue of Aug. 18, there appeared an article on the Croydon Corporation Water Supply, with a subhead: "Adoption of the Chlorine Process of Sterilization." Apropos of this article, I trust you will allow me space to point out that one of the most important features of the system selected by the Croydon Corporation for safeguarding their supply of water is its dechlorination after the injected chlorine has effected its object in destroying not only *B.Coli*, but any pathogenic bacteria with which the water may have become infected. Effective removal of this chlorine is a *sine quâ non* of the perfect system; otherwise an unpalatable water may result.

That the latter is so has been found to be the case in many places where chlorine has been added by rule-of-thumb methods, without any thought of its removal after its work has been accomplished; and it

was to ensure perfect chlorination, and subsequent dechlorination, that here (in Reading), where the system has been successfully in use for over four years, the Corporation, upon my advice, supported by the recommendation of scientific authorities and experts, adopted at their Southcote works the Candy "De-clor Filter System," which includes the treatment of water by automatic and accurate injection of the chlorine and the subsequent removal of the latter. It is this De-clor system that has proved successful in obtaining the approval of the Corporation of Croydon, after having been tested by their engineers and bacteriologists; the latter having artificially polluted the water under test to an extent far beyond that which would ever occur in an ordinary water supply.

Prior to these tests, the Candy De-clor system was inspected in operation at Reading.

I trust you will be able to insert this letter, as I do not wish your article to create a wrong impression in the minds of those having control of water supplies, which is what I fear it may do if it is not clearly understood that the system approved at Croydon is one not only of chlorination, but also of dechlorination; for while chlorine is well known as a bacteria destroyer, it is not at present, I believe, so well known that its removal can be effectually performed by what is known as the "De-clor Filter System."

LESLIE C. WALKER, Water-Works Manager.

Municipal Buildings, Reading, Aug. 27, 1914.

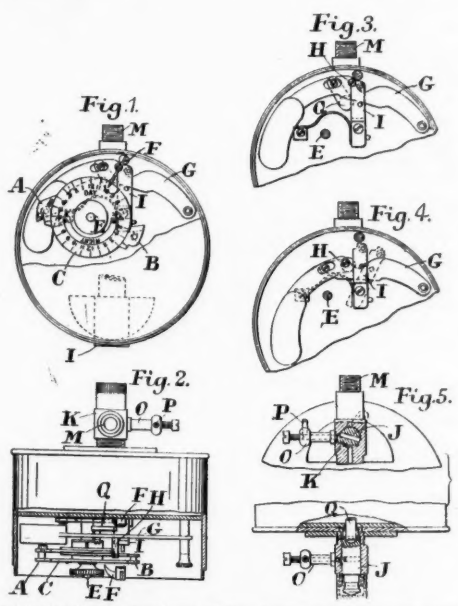
REGISTER OF PATENTS.

Actuating Valves at Predetermined Times.

FROST, A. C., and WRIGHT, A. C., of Witton, Birmingham.

No. 8025; March 30, 1914.

This invention is described by the patentees as applied to apparatus for automatically lighting and extinguishing a gas-lamp, in which communication between the burner and the supply is controlled by a rotary valve—a bye-pass being provided for the supply of gas to a pilot-jet whereby the main burner is ignited upon the valve being opened by the timing mechanism.



Frost and Wright's (Sutherland Meter Company) Time-Actuated Valves.

Fig. 1 is an elevation of the controller with part of the front casing removed to show the timing disc and tappets and the valve-actuating mechanism; fig. 2 is a plan; figs. 3 and 4 are elevations (with the timing valve removed) in the open and closed positions; and fig. 5 is a detail view of the valve—its actuating mechanism and its casing.

A pair of tappets A B are mounted friction-tight upon the hub of the timing dial C. Each is provided with an index whereby it may be set to any time, day or night, shown by the dial. This adjustment is made (as also the adjustment of the dial itself) before the dial is clamped upon the 24-hour arbor E of the clockwork motor. The dial is set by bringing the division on the dial corresponding to the required time into register with the fixed pointer F. A curved lever G is employed for actuating the valve controlling the supply of gas to the main burner and the bye-pass. The lever is fulcrummed at one end on the frame or casing of the motor for driving the timing mechanism, and having a weight at its other end. At an intermediate point of the lever is a pin H which projects into the path of the timing tappets, and with which also a latch I, fulcrummed on the motor casing, co-operates; the latch being urged under the action of a spring into engagement with the pin. When the lever is raised by the action of the tappet B, the pin is brought opposite a suitable notch in the end of the latch, which, under the action of the spring shown, is urged towards the left (full lines in fig. 4) with the notch below the pin; the lever G being thereby supported in the raised position. A pin or stud projects outwardly from the latch to co-operate with a similar pin or roller projecting inwardly from the tappet A on the timing dial C in such a manner that when the tappet is brought into engagement with the pin H, when the lever is in the raised position, the latter will first be raised slightly by the tappet A, thereby taking the weight of the lever off the latch, which is then displaced about its fulcrum, whereupon the notch swings free of the pin and the lever consequently drops—thereby shifting the valve to its other operative position. The swinging movement of the latch is limited by a stop projecting outwardly from the casing, and the bent arm of the latch I itself acts as a stop, arresting the lever G in its lower position.

The construction and operation of the several parts thus far described are well known. The rotary valve J and the casing K, in which it is removably mounted, are of themselves also of known construction. The casing has two apertures in its wall—one communicating with the gas supply pipe L and the other with the burner fitting M—and a third aperture communicating with a branch O leading to the bye-pass jet P, and provided with a regulating screw. The valve has two radial apertures adapted to register respectively with the apertures in K when the lever G is in the raised position. A groove is formed on the surface of the valve body by which gas can flow from the supply to the bye-pass aperture before the supply is completely cut off from the burner, and while the lever G is in its depressed position. Alternatively, the burner may be put in communication with the supply main when the lever is in its depressed position, and the bye-pass in communication with it when the lever is raised.

The inner end of the valve body is provided with slots for the reception of two pins projecting from the outer end of a rod or spindle Q mounted in the walls of the casing. On the inner end of the rod is an arm, and on the arm a pin which takes into a slot of elongated, triangular, or other shape, formed on the lever G. If the lever be shifted from one operative position to the other, it will, in its movement, cause the arm spindle and rotary valve to turn, so that communication between the burner and the main is either made or cut off. When the lever is shifted back to the first position, the valve J will be likewise rotated back to its first position. Means are also provided whereby the lever G is caused, when released by the latch I, to move into its depressed position, if it should for some reason or other fail to do so under the action due to its weight or a correlated spring.

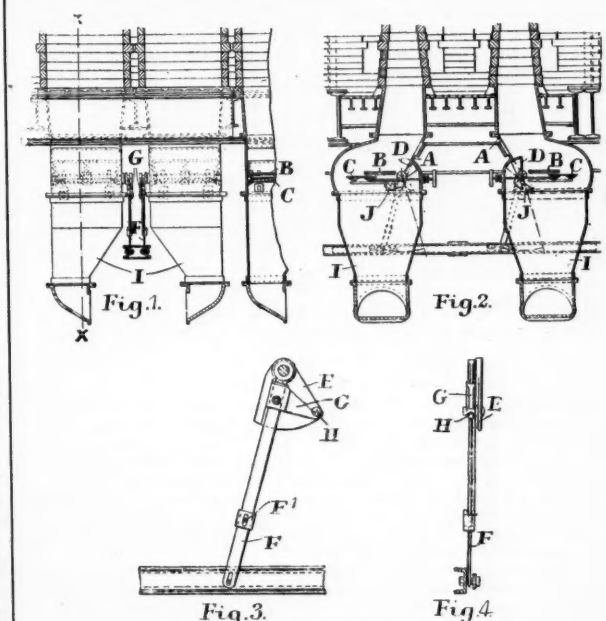
Discharging Vertical Retorts.

GLOVER S., of St. Helens, and WEST, J., of Southport.

No. 28,055; Dec. 5, 1913.

This invention relates to the extracting or discharging of coke, particularly from continuously operating coal carbonizing plants, with the object of providing "an improved form of extractor or discharger which, while efficiently performing its function, will result in a minimum of breakage of coke, and the consequent formation of breeze, and also will be economical in power construction."

The invention comprises the combination with the lower end of the retort, which is arranged to effect delivery of the contents of the retort through the side, of a plate projecting from the coke discharge outlet to such a distance that the carbonized material will rest on the plate at the angle of repose, and a substantially sector-shaped displacer adapted to be alternatively advanced and withdrawn so as to push the coke forward on to, and over the edge of, the plate, and then allow a further quantity to drop to the retort bottom.



Glover and West's Vertical Retort Discharger.

Fig. 1 is an elevation (partly in section) of the lower portion of a setting of vertical retorts. Fig. 2 is a sectional elevation on the line X and looking from left to right of fig. 1. Figs. 3 and 4 are views, at right angles to one another, of the means for actuating the discharging device.

The lower end of each retort is formed with a sloping side A opposite to the coke discharge outlet, and a plate or tray B is provided at the lower end of the side which projects to a sufficient distance beyond the open end of the retort that the coke will rest on it at the angle of repose—thus the retort will not discharge itself. The plate may be fixed in

a horizontal position; but there is preferably provided a second and adjustable plate C running on a track beneath the plate B, so that the extent of projection of the plate beyond the lower end of the retort may be altered to suit requirements. There is also a displacer D in the lower end of the retort in the form of a sector of a cylinder, or a plurality of sectors, mounted on a shaft to which rocking motion is imparted by any suitable means, such as a plate E fixed upon the shaft carrying the displacer, and a rocking arm F loose upon the shaft. The arm F carries a wedge-shaped part G adapted to engage a pin H on the plate, in order to rock the shaft. The return of the displacer is ensured by the rear portion of the part G engaging the ridge or flange on the plate E. Thus by adjusting the position of the part G on its arm F, the amount of movement given to the plate E and shaft for a constant movement of the arm F is altered. The part G is formed in one with, or attached to, an extension which can be locked to the lever F by a screw, so as to set the part G in any desired position.

The displacer D has a radial or curved face by which, during the forward stroke, a portion of the coke is pushed forward on to and over the outer edge of the plate C, when it falls to a chamber I, which is periodically discharged in the usual manner. As the displacer is withdrawn, the contents of the retort drop to fill the space vacated by it. The latter, when in its most advanced position, may have its radial face vertical, as shown at the right-hand side of fig. 2; and when in its initial position it may have the face flush with the retort side, as shown at the left-hand side. A balance-weight J acts on each displacer. The displacer is made to oscillate for discharging purposes through any desired portion of the distance constituting its maximum traverse by means of the arrangement shown in figs. 3 and 4.

Gas-Heated Furnaces.

King, J., Burnett, J. R., and the Richmond Gas Stove and Meter Company, Limited, of Warrington.

No. 16,871; July 23, 1913.

This invention relates to gaseous fuel heated furnaces as used more particularly for hardening and melting metals, and known commercially as lead or salt bath and crucible furnaces. It consists of a construction of furnace wherein the initial heat is generated at the upper part, and the heat and products of combustion are conducted around the crucible and to a point below the base of the metal pot before reaching the flue-pipe.

In one construction the combustion chamber is arranged in the upper part of the furnace, and preferably where the heat can play immediately and directly upon the crucible or metal pot at or towards its upper end. The crucible, by preference, is supported on a stand made of refractory material; but when a metal pot is used it is preferably supported by a flange or lip at its upper end resting upon a ledge in or at the top of the furnace, and in such a manner that a space is left all around the body of it, while the lower portion may rest on ledges of brickwork or on a refractory stand. The space opens into, or communicates, through a central opening in the floor of the furnace, with, a transversely disposed passage or flue, with its floor inclined, or sloped in one direction, towards the side of the furnace, where means are provided for closing the opening. In the other direction the flue communicates with a chimney or flue-pipe. The admission of secondary air is provided for by forming inlet openings at points just beneath the combustion chambers, or the air may pass into openings provided in the wall of the furnace at any other suitable point (or, if desired, near the base of the furnace) whence the air can be conducted through passages leading up to the combustion chambers—thus superheating the air. These air inlets or passages, of course, have valves or other means for regulating the supply of air.

Retorts or Distillation Apparatus.

Sykes, H., of Bideford.

No. 17,722; Aug. 1, 1913.

This invention has for its object to provide portable apparatus for the distillation of wood and the like; "so that, instead of (in the case of wood) bringing the latter to the retort or distillation apparatus, the apparatus can be taken to the supply of wood—thus reducing the cost of treating the wood or other material."

Gas-Cookers.

Marks, E. C. R.; a communication from the Automatic Stove Company, of Minnesota, U.S.A.

No. 17,302; July 28, 1913.

One of the objects of this invention is to provide means "for allowing the accumulated heat in the walls of the cooking receptacle to be employed for maintaining heat for a long period in the cooker, so that food in the latter will continue to cook long after the burner is extinguished." Another object lies in "the provision of means whereby all danger is avoided of gas accumulating in the cooker, and exploding when ignited." A still further object lies in "the provision of means for allowing all contaminating gases and steam to escape from the cooker before it is automatically sealed."

With the first of the above objects in view it has previously been suggested to cut off the air supply and extinguish the burners of cooking-stoves by the vertical movement of the cooking receptacle or a sleeve mounted on it; the vertical movement being caused by means operated by the diminution of the fuel supply. In the present invention a clockwork mechanism is provided for sealing the cooking receptacle by causing the vertical movement of the latter at a predetermined time—the burner of the heater becoming extinguished at the same time as the cooking receptacle is sealed. The extinction is caused either by the clockwork mechanism or the exhaustion of the fuel.

The means for elevating the cooking receptacle and retaining it in an elevated position until released by the clockwork timing mechanism, comprise a sleeve within which the cooking receptacle is removably supported, and having a yoke mounted on it, connected to a rod; means being also provided to engage the latter when the cooking receptacle is in its elevated position.

Gas Cooking-Stoves.

South Metropolitan Gas Company and Chandler, D., of Old Kent Road, S.E.

No. 8907; April 8, 1914.

This invention is directed to the improvement of the hot-plate of a gas-stove "with a view to greater efficiency and economy of heat."

Fig. 1.

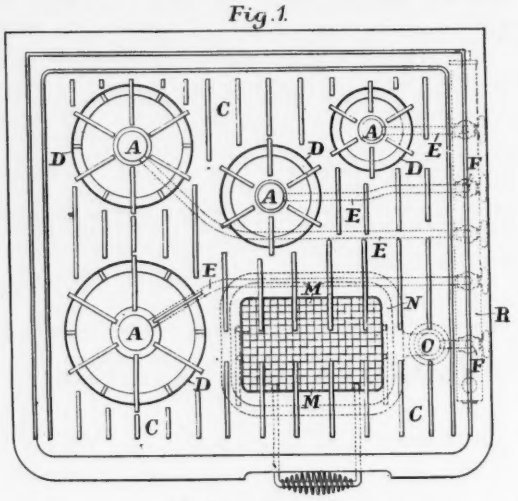


Fig. 2.

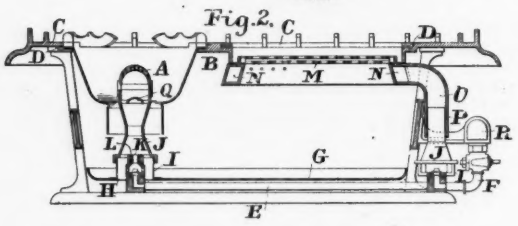
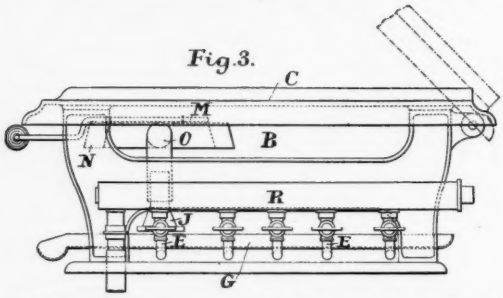


Fig. 3.



Chandler's (South Metropolitan Gas Company) Gas Cooking-Stove.

Fig. 1 is a plan of the hot-plate; fig. 2 is a front view partly in section; fig. 3 is an end view.

The cooker comprises a number of upright burners A arranged in the space B beneath the top of the hot-plate C opposite apertures D provided for the usual cooking pots, &c. The gas supply pipes E for the burners, laid at the bottom of the space B, terminate in vertically arranged injectors F. Over the pipes is laid a tray G of enamelled metal, and holes H are provided in the tray through which the injectors pass in an upward direction. Around the holes in the tray are walls I, which form tubular bases for the lower ends of the mixing-tubes J of the atmospheric burners [fig. 2]; the tubes being screwed on to nozzles L on the outside of the injectors. The mixing-tubes at their lower ends, a little distance above the part which screws on to the nozzle of the injectors, are enlarged so that they completely cover and rest upon the walls I surrounding the holes in the tray above mentioned. There is thus provided a space for the admission of air passing beneath the tray and entering the mixing-tubes through holes K provided in the lower ends of the latter. Two sets of air-holes are provided—one set in the nozzles to admit air direct to the gas as it issues from the injector centrally into the mixing-tubes, and the other set [that before mentioned] to meet the already mixed gas and airso as to further aërate the combustible mixture within the mixing-tubes.

In the holes of the hot-plate are removably arranged basin-like reflectors, through central holes in which the burners upwardly pass. The grilling appliance used comprises a deflector M, resting on a detachable ring-burner N, with a bent mixing-tube O adapted to drop on to, and form one with, a vertical tube P mounted centrally over an injector which stands up from the bottom of the hot-plate.

The burners are preferably round-topped; and the tops are constructed of fire-clay, steatite, or similar material pierced with a number of holes distributed all over the conical surface. Any form of burner-head, however, may be employed giving a solid atmospheric flame.

Within the mixing-tubes are centrally placed shields Q, for the purpose of deflecting from the injectors any grease, &c., which might enter the tubes through the tops of the burners.

The supply pipe R for gas is preferably placed at one end of the hot-plate [see fig. 3], and the pipes E leading to the burners branch laterally therefrom.

With the arrangement described, it is said that between 50 and 60 per cent. of the heat generated can be utilized.

MISCELLANEOUS NEWS.

BARNET DISTRICT GAS AND WATER COMPANY.

Profits Increased Despite Increased Cost of Coal and Oil and Reduction in the Price of Gas.

The Ordinary Half-Yearly Meeting of this Company was held last Wednesday, at the Holborn Restaurant, High Holborn, W.C.—Mr. ALFRED H. BAYNES in the chair.

The SECRETARY (Mr. Ernest W. Drew, F.C.A.) read the notice convening the meeting; and the report and accounts were taken as read.

The CHAIRMAN, in moving their adoption, said, before dealing with the working of the half year, they must all realize that the present terrible condition of war on the Continent was such as to create most painful anxiety and uncertainty as to the future, involving as it did a lamentable loss of life, acute grief, and distress for a long time to come. Certain of the Company's men were reservists and territorials; and the Directors were paying half the amount of the usual wages to the wives and dependants of those men who were out on their country's service. Up to the present, all the other men had been employed at full time. At the outbreak of the war, some little difficulty was experienced in connection with the delivery of oil; but this had now been quite overcome. There had been no difficulty in the supply of coal. He might mention that the Directors had that day agreed to send a sum of 200 guineas to the Prince of Wales's National Relief Fund. As to the report and accounts, he had no doubt that all present had carefully read the former and examined the latter; and he was confident they were well satisfied that the Company had had a satisfactory half year, due very largely to the valuable services of their able Engineer and Manager, Mr. F. J. Bancroft, well assisted by an efficient staff of competent helpers. As to the capital account, it would be noticed that they had not raised any additional capital during the half year; but the expenditure on capital had been £1193 on account of new plant and mains for gas and £8550 for water. Of the latter sum, £8286 was for sinking a new well at North Mimms; and he took this opportunity of saying that at present they had stopped all expenditure on account of the new pumping-station there. Referring to the gas revenue account, the total receipts had been £21,542, against £21,337 in the corresponding half of last year—an increase of £205. In looking at the individual items of income, an increase would be observed in all of them, except residual products. On the expenditure side, coal and oil had cost considerably more. In the half year, 6499 tons of coal had been used, which, thanks to the high carbonizing results obtained by the Engineer, had given them 14,015 cubic feet of gas per ton. Repairs and maintenance of works had cost £226 more than in the corresponding period of 1913, but nearly all the other items had showed a decrease—the net result being a profit on gas sold of £4584, as against £4556 twelve months ago. When they took into consideration the increased cost of coal and oil, and the depressed state of the residuals market, together with the fact that the price of gas was reduced 2d. from Lady-Day last, he thought that they could not fail to be very pleased with the final result. Turning to the water-revenue account, all the receipts exhibited an increase; and there was also a decrease in the allowance for empty houses. In the water expenditure, the individual items did not call for special comment; but it would be noted that the expenses, as a whole, were £681 less than in the first half of last year. The result was that their profit from water had risen from £13,047 to £15,210—an increase of £2163. To the contingency fund, it would be seen, they had charged part of the cost of the charging-machine—viz., £720; and the amount of the fund was now £7621. Turning to the profit and loss account, the profits from each department he had already mentioned; and, together with small sums from fittings and for interest, they made the total profit for the half year £19,956. Out of this they had to pay £2881 for income-tax and interest on temporary loans and debentures, and the dividend amounting to £13,937. It was also proposed to place £2000 to the contingency fund. The Board recommended an increase in the dividend of ½ per cent., as set forth in the recommendation in the report; and after payment of the increased dividend (the increase amounting to £777), they would have a balance to carry forward of £21,793, or £1137 more than the balance brought forward from the former half year. The Directors felt assured that the proprietors would regard the report with much satisfaction, indicating, as it did, continued progress and prosperity.

The DEPUTY-CHAIRMAN (Dr. J. W. L. Glaisher, F.R.S.) seconded the motion, which was unanimously carried.

The CHAIRMAN moved the declaration of a dividend, less income-tax, at the following rates per annum: 9 per cent. on the "A" and "C" stocks, 8 per cent. on the "B" stock, and £6 6s. per cent. on the "D" capital gas and water stocks.

Mr. H. G HILLS, in seconding, said he was sure the proprietors were highly gratified with the results of the half-year's trading.

Mr. A. F. PHILLIPS remarked that those who had been responsible for the supply of gas and water had recently had very anxious times; and he feared that there was a still more anxious period before them. Notwithstanding, from the statement the Chairman had given that day, the results of the Company for the past half year were highly satisfactory. He was therefore sure the proprietors would feel much pleasure in passing a hearty vote of thanks to the Company's staff for the services they had rendered. Mr. Bancroft and the technical staff under him would have to work harder this half year than they had ever done by reason of the number of men who had been called away. Mr. Drew, their able Secretary, would also be called upon to perform extra work. But the Directors felt confident that, in the hands of their officers and staff, the Company's interests would be satisfactorily protected.

Mr. W. B. BRYAN, in seconding, remarked that no one knew better than himself the anxieties at the present time of chief officers of such concerns as this. They were foregoing their holidays, and were working harder on account of their staffs being called away for patriotic purposes.

The motion was heartily passed.

Mr. DREW, in thanking the proprietors, said he trusted that, when they met in six months' time, it would be under more pleasant circumstances than those ruling at present.

Mr. BANCROFT, in his acknowledgment, said that his staff, men, and himself would use their best, and even try to surpass the record of their best, efforts on behalf of the Company in the difficult times through which the country was now passing.

Mr. H. L. ANDREWS, in moving a vote of thanks to the Chairman and Directors, said he knew quite well what they had had to do in recent times, and that they had to look forward to still more anxiety and trouble in the current six months. In attending the meetings of the Metropolitan gas companies, he was delighted to hear what the Directors were doing for the wives and children of the reservists and others in their employ who had been called up or had volunteered for active service. Whatever the Directors did in this way, they might feel assured they would have the confidence and the sympathetic approval of the proprietors. At the meeting of the South Metropolitan Company the other day, the Chairman stated that even now the Company were supporting some children belonging to the Company's men who had died in the Boer War; and the announcement was very heartily applauded. The difficulties of gas companies did not appear to be so great as those of some other commercial companies. Some commercial companies in which he was a shareholder had declared dividends, but were not going to pay them. On the other hand, the directors of gas companies were going to pay the dividends that were declared. He had no doubt their friend Mr. Richards would make use of this fact whenever he had the opportunity. [Laughter.]

Mr. W. RICHARDS, in seconding, said he could quite endorse the view as to the satisfaction that shareholders were feeling at the present time in connection with their dividend experiences in gas and water undertakings.

The CHAIRMAN, in the course of his reply, said he was glad that he had had so cheering a report to put before the proprietors, and to know that, other than the gloom of the war, the outlook for gas companies was so good.

PROPOSED REVISION OF PRICES AT LEEDS.

Two resolutions dealing with gas matters are expected to be submitted at to-morrow's meeting of the Leeds City Council.

The first, which is by Alderman C. H. Wilson, is—"That the Council make application to the Local Government Board for the issue of a Provisional Order under sections 297 and 303 of the Public Health Act, 1875, to partially repeal, alter, or amend the Leeds Corporation (Consolidation) Act, 1905, so as (1) to remove the limitation contained in section 46 of such Act as to the amount of rebate which may be allowed by the Council to gas consumers, or to repeal that section and confer further powers upon the Council for the supply of gas by agreement; (2) to include the township of Thorner, in the Wetherby rural district, within the 'gas limits' of the Council; and (3) for the several purposes of this application, or for purposes connected with, incidental to, or consequent on those purposes, to make any such alteration or amendment of the said Local Act or of any other Local Act, or of any Act confirming a Provisional Order made in pursuance of any of the Sanitary Acts or of the Public Health Act, 1875, and in force in the city, as may be necessary or desirable."

The second resolution stands in the name of Alderman W. Penrose-Green (the Chairman of the Gas Committee)—"That as and from Oct. 1, 1914, the Council adopt the following revised scale of charges for gas supplied to consumers within the city: For lighting, heating, and cooking, consumption per quarter, under 500,000 cubic feet, 2s. 2d. per 1000 feet; 500,000 to 750,000 feet, 2s. 1d.; 750,000 to 1,000,000 feet, 2s.; 1,000,000 to 2,000,000 feet, 1s. 11d.; 2,000,000 feet and upwards, 1s. 10d. Provided, however, that this scale shall only apply to the consumption of gas taken in a particular tenement, and not to the aggregate amount of gas consumed in separate tenements. For motive power and furnace work purposes as specified: All consumers, 1s. 9d. per 1000 cubic feet. The gas for furnace-work purposes includes that used in the following processes: Tool and case hardening, metal melting, annealing, forging, hardening, tempering, crucibles, muffles, and the glass industries. The gas used for these purposes must be registered through a separate meter from that used for power purposes. Also that the resolution of the Council of Dec. 4, 1907, on the subject be varied accordingly."

WEST BROMWICH GAS UNDERTAKING.

Successful Fight against Electricity.

There are indications that the West Bromwich municipal gas undertaking is regaining much of the ground which it lost during the boom of electricity in the borough, and the new Engineer, Mr. Johns, is sparing no pains to popularize the concern of which he has charge.

Some years ago, when the electricity boom was on, large numbers of the principal tradesmen and private residents turned their backs upon gas and introduced electricity; and for a period the gas undertaking seemed to be getting the worst in the competition for patronage. Even the Corporation themselves discarded the gas lighting of High Street, the main thoroughfare of the town, and adopted an expensive scheme of electric lighting. This step tended to further increase the popularity of electricity, and for a time gas undoubtedly took a back seat, and electricity was introduced into the public buildings. Notwithstanding the triumph of the new illuminant, however, the late Manager, Mr. Copp, and his Committee fought strenuously to recover some of the lost ground; and the competition between these two municipal undertakings has been, and is still, a matter of absorbing public interest. In order to help the Gas Committee in their efforts to successfully meet the electrical competition a public show-room, which was well stocked and brilliantly lighted, was opened in High Street.

This venture was strongly opposed by local tradesmen at the time, on the ground that it was unfair for the Gas Committee to engage in such competition. But the storm of protest that was raised soon subsided, and the show-room has unquestionably done a great deal to re-establish gas in the affections of the inhabitants for lighting and power.

What above all other things has helped gas in West Bromwich has been the introduction of the high-pressure system, which has fairly "caught on." Many of those who changed from gas to electricity have gone back to their first love, and the gas undertaking is now fast regaining the strong position it once held. One of the hardest blows which the electricity undertaking received was when, after a considerable test, the Highways Committee recently decided to revert to gas for the lighting of High Street; and the main thoroughfare of the town is now splendidly illuminated by means of the high-pressure system. Many tradesmen and private residents have followed the example of the Town Council; and one leading inhabitant, whose house was set on fire in the early hours of the morning—it is alleged through the fusing of an electric cable—has just given instructions for the whole of the electrical apparatus to be removed from his premises and gas again laid on. This work is being carried out by Mr. Johns.

LARGER COAL RESERVES ON GAS-WORKS.

[From a Correspondent in the Midlands.]

Practically speaking, contracts for gas fuels have now been arranged, for supplies to the end of June next. Certainly in one or two instances gas concerns still have a considerable proportion to fix up; but negotiations are expected to be concluded shortly.

The terms for renewals obtained by gas engineers are somewhat irregular—so far as the price reductions secured are concerned. It will be remembered that early in the season it was pointed out by the writer how the position of the "associated" collieries (which had expected to encounter little difficulty in renewing their contracts at the same prices) was undermined by outside collieries offering reductions of 6d. per ton, and booking orders very freely, with the result that the "associated" collieries were eventually compelled to allow the same reduction. The market continued to show much weakness; and by gas engineers holding off reductions up to 1s. 3d. per ton have been obtained. Much depended on the basis pit price; and while generally the reduction on screened gas coals has been 1s. per ton, the reductions on unscreened coals and gas slacks have been considerably more—owing to the comparatively weaker position of slacks, as against coals, during the last contract period.

As the effect of the war has resulted in a considerable reduction in shipments during August, and on the whole the house coal trade is much quieter than usual for the time of the year, there is a favourable opportunity for gas engineers to put in heavy reserve stocks, without having any appreciable effect on the house coal market. In view of the uncertain outlook, and the possibility of interrupted railway working through fogs or any other cause, it certainly seems desirable that the question of reserve stocks on vacant ground at gas-works should receive greater attention than usual, and especially so in view of the possible interrupted working at pits owing to a shortage of mining timber. It is hoped that there will be an increase in the imports of mining timber under the Government scheme of insurance; and while there is no cause for any immediate anxiety on this account, it can be readily seen how the question of coal outputs may be affected later on. Most collieries still have moderate supplies of timber; and although, owing to the war, timber contracts are in suspension, there are said to be considerable stocks at ports, for which advances of from 25 to 75 per cent. are demanded. It is understood that the Mining Association of Great Britain have made certain representations to the Board of Trade on this question; and no doubt a statement will be issued shortly that will clear up doubts on the matter.

Owing to the large number of waggons held up under load at ports, and also to the heavy stocks at some of the pits that do a big shipping trade, there is a decided scarcity of empty waggons which is very seriously interfering with the production of coals at the moment.

PRICES UNDER TAR CONTRACTS.

In reproducing some remarks contained in a letter received yesterday from a correspondent on the subject of prices under tar contracts, it may be added that we shall be pleased to have the views and suggestions of other readers on the matter. One suggestion, it will be noted, is already to hand. This was already in type when our other correspondent's letter reached the office yesterday morning.

An Inquiry

Our current contract with tar distillers is based on the weekly quotations in the "Journal;" this arrangement having been decided upon as a temporary expedient pending our deciding whether to put down tar distilling plant.

Tar prices are not now being quoted in the "Journal," as you know; and though I recognize that the price in the circumstances is a matter for settlement between the tar distiller and ourselves, I know that other gas-works must be placed in a similar position, and I should be extremely glad to know if you have any idea what any other gas undertaking similarly situated is doing in this matter.

While the actual present value of tar and its bye-products may be very low, due to tar and its bye-products probably going into stock at the distillers' works, when the markets for bye-products are re-opened prices will, of course, be formulated. But this, unfortunately, may be a long time off.

And a Suggestion.

The following suggestion for meeting conditions which they point out exist is offered by a firm of manufacturing chemists and tar distillers: "Seeing that a large number of tar contracts (on sliding-scales) are based on the prices you give weekly in the 'Journal,' this is going to cause some inconvenience until the time comes when shipments can be resumed. Of course, it is obvious, under the conditions now prevailing, that nobody can say what tar is really worth. Our object in writing you on the subject is to offer a remedy for the situation, which is that distillers pay £1 per ton for all deliveries of tar up to the time when shipping again begins; and should tar then be quoted higher or lower than this figure, the difference to be paid to whichever side it is due."

THE CHEMICAL MANUFACTURING TRADES.

A Chance for this Country.

After the statement that there is an important movement on foot for the appointment of a Government Committee to consider the best means of applying the resources of this country to the development of the chemical industry (which has been hitherto largely in the hands of German manufacturers), that the subject is closely allied with the welfare of many branches of British trade, and that the probability of reviving an old industry is regarded as hopeful in City circles, the "Evening Standard" last Tuesday published an interview which one of their representatives had that day had with Dr. F. M. Perkin, the Consulting Chemist. Dr. Perkin (who is a son of Sir William Perkin, the discoverer of aniline dyes) is reported to have expressed the following views.

Germany supplies us with a very large quantity of chemical material which there is not the slightest reason we should not manufacture ourselves. Coal-tar dyes exported by Germany to England represented £1,656,000 last year. The artificial indigo exports from Germany were 33,353 metric tons in 1913. Indigo is not obtainable in this country to-day; and there is no possibility of getting an increase of the Indian output under a year-and-a-half. Even then, owing to the small amount under cultivation, there may be difficulties in the seed supply. It is not likely that the indigo planter will be prepared to lay down a larger acreage, unless he has some guarantee that the Government will take the product, and that it will therefore pay him to cultivate it. It would be extremely costly, and would take a considerable time, to put down a factory in this country to manufacture artificial indigo. In heavy chemicals—such as caustic soda, sulphuric acid, &c., the United Kingdom fairly holds its own. At the same time, Germany exported considerable quantities of these products last year. There is not the least reason why existing British manufacturers should not get the whole of this trade. There should be no great difficulty in adding to their present resources to meet the demand. I have been approached by several people in London as to whether it would not be possible to put up large works (such as those at Mannheim and Elberfeld) to manufacture fine chemicals and other similar products. My own opinion is that at the present time this would not be a wise proceeding. It seems to me that it would be much better in the first place to use the existing facilities, and get the chemical manufacturers to take up new lines in which they might employ a portion of their existing plant. The starting of a chemical manufactory requires great practical experience and special plant.

I have approached several leading manufacturers; and I find that there is a desire to help the country. But the question arises: Will the Government assist them in founding these new industries? I hope the Government will appoint a small committee of chemical experts and business men, who could consult with the chemical trade of the country, and find out what branches the present manufacturers could most readily take up. It might ultimately be advisable to start special works to manufacture articles which cannot at present be made. Such a committee should be appointed at once, and report within the shortest possible time.

Gas-Worker's Bravery.—At a public meeting held last week in the Town Hall, Banbridge, a purse of sovereigns, subscribed by the townspeople, was presented to Mr. Hugh Adamson, in recognition of his bravery in endeavouring, in December last, to save the life of Mr. Geo. A. Mearns, late Manager of the Banbridge Gas-Works, when an explosion occurred in the engine-room. Mr. Adamson, at great personal risk, rushed into the room, leaped the flames, and brought out Mr. Mearns, who, however, received severe burns, and died a few days later. Mr. Adamson was also badly burned. Some time ago his Majesty the King decorated Mr. Adamson for his act of heroism and courage; and he has also received recognition from the Carnegie Fund and from the Society for the Protection of Life from Fire.

Watford Gas Company.—The ordinary half-yearly general meeting of this Company was held last Thursday—Mr. E. J. Slinn (the Chairman) presiding. The report, which was accompanied by the accounts, set forth that the sale of gas again showed a substantial increase, but that the prices for residuals had declined considerably. On the revenue account there was a profit of £5056; and on the profit and loss account a balance of £7706 available for distribution. The Directors recommended that dividends should be declared on the "A" stock at the rate of £7 7s. 6d. per cent. per annum, and on the "B" stock at the rate of £5 17s. 6d. per cent. per annum, both less income-tax. The Chairman, in moving the adoption of the report, said that in the past half year £6529 had been spent on buildings, plant, &c., which covered the completion of the new gasholder and attendant works. The sale of gas had been quite satisfactory, with an increased return of £843 for the six months. Meter-rentals and prepayment meters were also up by nearly £1000. Referring to the present national crisis, the Chairman said that eight of the Company's best men had gone to the front. The Directors had taken steps that their wives and children should not suffer, and their places would be kept open for them. Thirty-one of their men had been enrolled as special constables, and were engaged in guarding the works. Stocks of coal were coming in every day; and they hoped to be able to hold out a long time. The report was adopted.

EXPORTS OF GAS-MOTORS FROM GERMANY AND AUSTRIA-HUNGARY.

A report issued last week gives particulars for a recent year of the value of certain descriptions of internal combustion and explosion motors, gas-motors, &c., exported from Germany and Austria-Hungary to all destinations. The following were the exports from Germany in 1912 and their value: Stationary combustion and explosion motors, motors using blast-furnace gas, £1,472,000; steam and gas turbines in combination with dynamos, &c., £617,000; combustion and explosion motors, blast-furnace gas motors, &c., &c., £81,000; individual parts for steam-engines, steam and gas turbines, &c., £656,000—total, £2,826,000. From Austria-Hungary there were exported in 1913 motors not specially mentioned (including combustion and explosion motors, but excluding motors for automobiles and steam and electric motors) to the value of £37,000. The principal German markets for stationary combustion and explosion motors and blast-furnace gas-motors were Russia, France, Argentina, Roumania, Egypt, and the United Kingdom. Steam and gas turbines combined with dynamos, pumps, hammers, &c., were sent mainly to Russia, the United Kingdom, Spain, British South Africa, Italy, and France. Combustion and explosion motors, combined with dynamos, pumps, &c , were exported mainly to Russia. The exportation of parts of steam-engines, steam and gas turbines, and combustion and explosion motors has attained considerable dimensions. The principal markets were naturally much the same as for complete motors, especially Russia, France, Argentina, and the United Kingdom.

His Majesty's Trade Commissioner for South Africa, in a special report made last year, said the present position of British-made oil-engines is by no means satisfactory, though it is capable of improvement. In engines of more than 5 H.P. capacity, the United Kingdom practically controls the market; but in the smaller sizes American makers are in a commanding position, though British firms are making their influence felt in their endeavours to compete. Germany does very little trade in this line.

In a recent American consular report on the Bombay Presidency, it was stated that oil-engines and pumps for lifting water were successfully making their way into all the agricultural districts; and their introduction had awakened in the minds of thousands of landowners and cultivators an interest in mechanical methods of doing work which was entirely new to the country. For India, the internal-combustion engine has proved an ideal source of motive power. Suction-gas producer plants of high horse power have been a failure in the Presidency, notwithstanding the efforts made to extend sales; and they have in most cases given place to engines using oil.

In a report made by the British Vice-Consul at Beirut about the middle of 1912, he stated that suction engines of 35 H.P. (price £300) for use with anthracite coal for ice-making and flour-mills were occasionally in demand; but he said the only advantages that German engines, which are from 10 to 15 per cent. dearer than the British, have over the latter are, first, that the Germans often give as much credit as two years for payment, while the British manufacturer demands cash against documents; and, secondly, that they were first in the market. But the Germans, he was told, found such difficulty in collecting the money that they would probably have to desist from giving credit, and a better chance for the British article would be assured, especially if a clever agent with a knowledge of Arabic were sent to travel in the interior and demonstrate the working of the engines.

Germany holds a very favourable position in the trade in gas, petroleum, and hot-air and steam engines and boilers in Japan. The imports under these several headings from Germany and the United Kingdom during 1913 were as follows:—

	Germany.	United Kingdom.	Total.
Gas, petroleum, and hot-air engines	£36,000 ..	£58,000 ..	£122,000
Steam-engines	22,500 ..	22,000 ..	57,000
Steam-boilers and parts	15,000 ..	66,000 ..	98,000

Germany's supplies of gas, petroleum, and hot-air engines have increased from about £17,000 in the year 1912; and an even more remarkable increase is shown in the imports of steam-engines—the figures for 1912 being only about £4500. On the other hand, the imports of gas, petroleum, and hot-air engines from the United Kingdom decreased from about £99,000 in 1912, whereas the imports of steam-engines were stationary in 1912 and 1913; both years showing a considerable decrease as compared with 1911.

In a German consular report it is pointed out that a keen demand for gas-motors has recently sprung up in Japan. A recent French report states that the imports of gas, petrol, and hot-air motors has doubled in two years. The use of small gas-motors, in particular, is spreading rapidly. Important manufacturers have found it advantageous to provide themselves with powerful motors, 70 per cent. of which have been supplied by the United Kingdom; but Germany's share has increased considerably since 1910.

A Penchant for Gas-Meter Coppers.—For the second time within three months, T. F. Godfrey, a painter, of Knowsley Road, Battersea, appeared before Mr. Lister Drummond at the South-Western Police Court, charged with stealing a sum of money from an automatic meter belonging to the Gas Light and Coke Company. A collector said that on examining the meter he found a staple had been forced and 2s. 6d. extracted from the box, which contained 3s. 2d., while the register showed there should have been 5s. 8d. Prisoner admitted he had broken the meter open, and pleaded that he was under the influence of drink at the time. Detective Eastlake informed the Magistrate that on June 8 prisoner was sentenced to two months' hard labour for stealing 2s. 4d. from the same meter; and Mr. Drummond now sent him to prison for three months with hard labour.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Aug.* 31.

The position in tar products remains unchanged. Practically the only article in which business is being done is crude carbolic acid. Values remain at about the same level as last reported.

There is an absence of inquiry for sulphate of ammonia, and the price is normal at £10 15s. per ton, naked, at makers' works, for 25 per cent. quality.

Manchester Tar Prices.

It is officially announced that the average price realized for July deliveries of tar in the Manchester district—based on the value of the products—was 29s. 8d. per ton.

Tar and Tar Products in the Provinces.

Aug. 31.

There is nothing particular to report concerning the market for tar products. Values are purely nominal; and it is hardly wise to mention them for any particular purpose.

Sulphate of Ammonia Prices in the Provinces.

LIVERPOOL, *Aug.* 29.

During the past week there has been a resumption in the shipment of this article on a larger scale, but there have been ample supplies to meet all requirements. Although freight facilities have improved, the question of finance has stood in the way of foreign business to a considerable extent. The closing quotations are £10 11s. 3d. per ton f.o.b. Hull, £10 12s. 6d. f.o b. Liverpool, and £10 15s. f.o.b. Leith. The forward position has remained without animation; buyers preferring to look on meantime than to pay the prices asked by manufacturers.

Nitrate of Soda.

The market for this material is easier, and the value on spot is now 11s. per cwt. for ordinary, and 11s. 3d. for refined quality.

COAL TRADE REPORT.

Northern Coal Trade.

There is a rather fuller demand for coals for certain districts and countries; but it is far below that which is usual, and short time is very frequent at some of the collieries, especially in Northumberland. In steam coals, prices are a little easier, with best kinds about 13s. to 13s. 6d. per ton f.o.b.; and second-class steams about 11s. 3d. per ton. Steam smalls are generally steady, and are quoted from 6s. 9d. to 10s. per ton f.o b. Some classes of smalls are scarce, and thus rather dearer relatively. In the gas coal trade, there is a fair shipment to the south on contract; but small steamers are not so plentiful, and shipments to some ports are consequently restricted. Best Durham gas coals are 12s. 6d. to 13s. per ton f.o.b.; second qualities of gas coals are about 11s. to 11s. 6d. per ton; and "Wear specials" are tolerably steady at 13s. per ton f.o.b. Some Italian demand for gas coal is showing itself. There is, however, difficulty in arranging terms of payments; buyers asking for payment on delivery, while sellers desire payment on shipment. The coke trade seems steadier, on the whole. Gas coke is now in a little more demand for export to some of the Scandinavian countries; but the production is increasing. About 11s. 6d. to 12s. per ton f.o.b. is now the current quotation for gas coke.

Gloucester Gas Company's Profit-Sharing Scheme.

A very satisfactory state of affairs was revealed at the sixth annual meeting of the participants in the profit-sharing scheme of the Gloucester Gas Company, which was held at the gas-works, Hempsted, on Monday last week. In their report the Committee stated that the bonus divided among the members for the year ended the 30th of June last was £631 15s. 7d., being again at the rate of 7½ per cent. A sum of £400 had been invested on mortgage with the Company, and £300 of the Company's stock had been purchased at a cost of £336 5s. The accounts showed the following balances at the end of the year: Trust account, £1359 15s. 4d.; withdrawal account, £1007 17s. 8d.; savings account, £640 19s. 2d.—total, £3008 12s. 2d., compared with £2729 on June 30, 1913. The Chairman (Mr. J. H. Jones), referring to the accounts, remarked that there had been an increase of £279 in the funds. In addition, £214 had been paid for the Company's stock which had been transferred to individual members, and he thought they could fairly consider that the funds had increased by £493. The bonus for the year was at the same rate as in the preceding year. One member had died during the year, and nine had left for various good reasons; and he thought all the nine had found the money which they had through the scheme very useful on entering new lines of life. Mr. James had been as useful and helpful a Secretary during the year as in the previous years, and all who had had reason to consult him had found him sympathetic and helpful. The report and accounts were adopted. A hearty vote of thanks to the Chairman was proposed by Mr. T. S. Ellis and seconded by Mr. F. Jones; the latter remarking that the men were very grateful to the Directors for all they had done in connection with the scheme. The Chairman acknowledged the vote, and proposed a similar compliment to Mr. James, to whom, he said, they were all grateful for the work he did as Secretary. The vote was heartily accorded.

Normanton Gas Company.

That the Company had had a very successful six months was stated by the Chairman (Mr. John Armitage) at the recent half-yearly meeting of the Company. As extensions costing from £6000 to £7000 were now in progress, he said, they found it necessary to issue new capital; but the earning power of the Company was such as to leave a very ample margin, after providing the additional interest. Though they had made 744,000 cubic feet more gas than in the corresponding period, they had used 12 tons less coal. The total income was £6613, and the profit £2448, which was £50 less than a year ago. Having regard, however, to the fact that coal had been so dear and the residuals market so bad, the Directors considered the results very satisfactory. Should the Company be seriously affected by the war, they were fortunate in having the ample reserves they possessed for equalizing dividends. Dividends for the half year were declared, of 6 per cent. on the original stock and 4½ per cent. on the additional stock; and the Directors were authorized to issue £5000 of additional ordinary capital, and to borrow on mortgage £3700. The Secretary and Manager (Mr. E. H. Hudson), in explanation of the need for this new capital, said that during the last few years the Company had expended over £8000; but instead of issuing capital they had used up all the surplus balances in the business. Though this had been done free of interest, they had had to arrange for an overdraft at the bank for working capital; and now that it had been resolved to introduce vertical retorts, it was necessary that some further capital should be provided. During the last few years, the sale of gas had increased by no less than 57 per cent., which was of itself evidence of the necessity for the additional plant.

Southend Gas Company.

Speaking at the half-yearly meeting of the Company on the business during the past six months [*ante*, p. 479], the Chairman, Mr. C. F. Woosnam, J.P., referred to the Bill, which was Royal Assented early in August. He said the Board were well satisfied with the grants which Parliament had made them. They now had a considerably extended area, testing by calories instead of by illuminating power, and the capital increased by £200,000—enough to last them for many years to come—with the ordinary borrowing powers on this amount. Clause 16 was the only one in the Act that they could not say they approved of. This was the capital redemption clause, which did not sanction the payment of higher dividends than they were paying at the present time until the capital was reduced by £30,000. The clause was inserted in consequence of expert opinion that their capital was too high. He was still of opinion that, in consequence of the rapid growth of the borough, their capital must necessarily be high. However, he felt sure it would not be many years before they had wiped out the £30,000, and returned again to the sliding-scale. In the meantime, he thought, as business men, they would be satisfied with what he should call a very good interest on their outlay; and they were strengthening their concern by the reduction of the £30,000. Subsequently Mr. J. H. Burrows, touching upon the same matter, remarked that, though the Company did not propose clause 16, which was imposed upon them in its present form by a body who represented the town, and who did not represent the shareholders, yet at the same time the clause was for the protection of the shareholders, and could only work in that way. The paying off of the £30,000 meant that to this extent every shareholder would be made more safe in his holding. Directly they got back again to normal working, the payment of the £30,000 would not be a serious trouble to the Directors; and he was perfectly certain they would be able to accomplish the task in a very few years. The result of it would be that at a comparatively early date they would resume the sliding-scale in the position of having £30,000 of capital bearing interest wiped off, and therefore with more certainty that the sliding-scale would operate for their benefit.

Ryde Gas Company.—At the annual general meeting of this Company last Thursday, the Directors reported that in the year ended the 30th of June there had been an increase of 1,892,400 cubic feet in the quantity of gas sold, compared with the year 1912-13; and that they were seriously considering the desirability of adopting the vertical system of retorts. The accounts accompanying the report showed a balance of £5046 available for distribution; and the Directors recommended the payment of the full authorized dividend at the rate of £5 15s. per cent. The Chairman (Mr. E. Groves, J.P.) moved the adoption of the report; and the motion was carried. A vote of thanks was accorded to the Directors for their attention to the interests of the Company during the past year; and also to the Engineer and Manager (Mr. F. F. Farrand), the Secretary (Mr. A. E. Coombes), and staff for their services. The stockholders unanimously voted the sum of 50 guineas to the National Relief Fund.

Barnsley Gas Company.—At the annual meeting of this Company last Thursday, the Directors reported a profit of £7895 on the working in the past financial year; and they recommended that, in addition to the interim dividend paid in March, a further dividend of 5 per cent. on the general capital stock and "F" shares, 3 per cent. on the "C" (preference) shares, and 3½ per cent. on the "D," "E," and "G" shares, less tax. The Chairman (Mr. E. G. Lancaster), in moving the adoption of the report, said the profit was sufficient to pay the maximum dividends, with the exception of £14 12s. The total expenditure had been £23,994, or £284 less than in the preceding year. They had had to pay £930 more for coal, but had exercised economies in other directions. On the revenue side of the accounts, there were both encouraging and discouraging items. But, notwithstanding everything, they had been able to produce the profit the Directors had before them. It was a very difficult matter to prophesy in the present circumstances; but the proprietors were sanguine enough to think that unless some huge catastrophe took place in England they would next year be able to show figures no worse than those now submitted. The report was adopted.

Tyldesley-with-Shakerley Gas and Water Supply.

In his report to the Gas and Water Committee, for the year ended March 31, Mr. Hedley Hoy (Engineer and Manager to the Tyldesley-with-Shakerley Urban District Council) states that the gross profit of the Gas Department for the twelve months amounted to £2848; the net profit being £831. The gas made (59 million cubic feet) showed an increase of 8 per cent. over the preceding year. The production per ton of coal carbonized was 10,920 cubic feet, or 516 feet more than a year ago, equivalent to a saving of 266 tons of coal. The unaccounted-for gas, owing to the district, and the condition of a number of old service-pipes, stands at 14·9 per cent. There are now 1529 prepayment consumers, constituting 46·2 per cent. of the whole. Mr. Hoy adds: "An interesting feature of the greater gas consumption is the considerable increase in the day load, which shows that the advantages of gas for cooking are being appreciated. The number of cookers in use at the end of March was 544, or 16·5 per cent. of the total gas consumers. The average for the country is 50 per cent., and in many towns 90 per cent. of the consumers use gas for cooking—showing there is still scope for increased gas sales in this direction." The accounts of the Water Department for the year show a loss of £170, which compares with a loss of £68 made during the preceding twelve months.

Use of Coke in Open Fires.

In a recent number of the "Sanitary Record and Municipal Engineering," a contributor, writing under the *nom de plume* of "Senex," stated that coke prepared in the ordinary way "is only suitable for close stoves." To this statement another contributor, "Juvens," replied as follows in last Friday's issue: "The context clearly shows that he refers to an apparent difficulty in maintaining a fire of gas-works coke. I therefore desire to inform you and your readers that I have successfully burnt ordinary gas-works coke in my home for the last three years. I have used it in a modern slow-combustion fireplace and in a dog grate with gratifying results; and it has been burnt in the kitchen range with every success, both as regards cooking and water heating. It is true there may be some difficulty in starting-up with coke; but one can readily surmount this by the use of coal in laying the fire. The successful employment of coke depends upon the fact that a good draught must be maintained. The only way effectively to secure this condition is periodically to poke the fire so thoroughly that the ashes are not only swept from the fire-bars, but are also knocked off the incandescent lumps of coke as far as possible. After this rough treatment, the fire may become somewhat dull for a short time; but it rapidly recovers unless it has been allowed to burn very low. The addition of fresh coke should be made at frequent intervals and in small quantities, to secure the best results. My own experience of coke for domestic purposes has been so gratifying that I have no wish whatever to return to coal-fires. During last winter I burnt about three or four chaldrons of coke, and not more than about two or three hundredweight of coal—the latter for starting the fire only." The writer concluded by suggesting to "Senex" that he should make some trials with coke on the lines he had laid down.

Brindisi Water Supply.—The water supply of Brindisi, says a British consular report, is derived mainly from an old Roman aqueduct in a poor state of repair, rain water, and wells. The supply is scanty, and the well water polluted. The completion of the Apulian aqueduct will remedy this state of affairs. The event is anticipated officially in 1916, but may be delayed, as strikes among the workmen are of frequent occurrence.

Woking Water and Gas Company.—In anticipation of the sixty-fourth ordinary general meeting of this Company, to be held at the Great Winchester Street offices to-day (Tuesday), the Directors have issued their report and a statement of accounts for the half year to June 30. The balance at the credit of the profit and loss account is £7832, out of which the Directors recommend a dividend at the rate of 6 per cent. per annum (less income-tax), which will absorb £4743; leaving £3089 to be carried forward. During the half year 95 additional house and 31 meter connections were made; while the service mains were extended 1907 yards. The Manager (Mr. W. H. Ely) reported to the Board that the machinery, plant, and mains are "in excellent working order."

Hartlepool Gas and Water Company.—The Directors, in their annual report, stated that the total revenue for the past year was £98,976 and the expenditure £63,752, leaving a balance of £35,224 to the credit of profit and loss account, out of which £3325 has been paid for interest on loans, &c., and £15,821 as interim dividend in March last. The Directors recommended the payment of a dividend for the past half year at the rate of 5 per cent. per annum on the whole of the paid-up consolidated capital of the Company, less income-tax. The plant continues to be maintained in a satisfactory condition: but it will be necessary at an early date to remodel some parts of the present carbonizing plant by the installation of more modern retorts and apparatus for handling coal and coke. Notwithstanding the extraordinary drought of the past year, the supplies of water were ample both for trade and domestic purposes. Mr. Thomas Bower, who has served the Company as Engineer and General Manager for thirty years, having, owing to the unsatisfactory state of his health, asked to be relieved of the more arduous part of his duties, the Directors with regret have complied with his request, and have appointed him Consulting Engineer to the Company. As Engineer and General Manager, the Directors have appointed Mr. Arnold W. Branson, who for the past seven years has held a similar position with the Rhymney and Aber Valleys Gas and Water Company, and previously for several years acted as Assistant Engineer under Mr. Bower at West Hartlepool. The Directors concluded by recommending that in future the annual accounts of the Company be made up to Dec. 31, instead of June 30, and that the meeting be held in February, instead of in August.

Gas Poisoning Fatality in Birmingham.—George Ballard, a refreshment house keeper, of Birmingham, was found dead in his shop last Tuesday night, under circumstances which led to a verdict of suicide by the Coroner's Jury. By his side was a rubber tube attached to a gas-bracket; the gas being turned on. The medical evidence was to the effect that the appearance of the body was consistent with suffocation by gas.

Improved Results at Chichester.—When presenting at the half-yearly meeting of shareholders the report of the Directors for the six months to June 30 [*ante*, p. 415], the Chairman of the Company (Mr. W. A. Walker) stated that their carbonizing results were better than those of a year ago, inasmuch as they had in the sales of gas an increase of £129 over the corresponding period, while at the same time they had used 14 tons less coal. The gas sold per ton of coal carbonized had been 11,278 cubic feet, in comparison with 10,905 feet last year. Mr. Joseph Cash also drew attention to the fact that their new Manager (Mr. T. N. Ritson) had succeeded in improving on previous records in several instances.

Horley Gas Company.—At the half-yearly meeting of this Company last Thursday, the Directors reported an available balance of £1067; and the Directors recommended the payment of dividends at the rate of 5 per cent. per annum on the preference stock, 4 per cent. per annum on the "A" capital stock, and £2 16s. per cent. per annum on the "B" capital stock (all less income-tax). This would absorb £1025 and leave a balance of £42 to be carried forward. With a view to offering an inducement to all employees to take greater interest in the business and well-being of the Company, the Directors had adopted a co-partnership scheme embodying the principles of systems working satisfactorily in several other companies; and they said they were confident that its operation would mutually benefit the employees, consumers, and proprietors. The report was carried unanimously.

Dover Gas Company.—The half-yearly meeting of this Company will be held on Monday next. The Directors in their report to be submitted say that, as foreshadowed at the last half-yearly meeting, owing to the very high price paid for coal, the profits of the last six months are not sufficient to provide for the payment of the statutory dividend. The 7¼ per cent. per annum which the Directors recommend will reduce the balance brought forward from past years by the sum of £1318. Contracts for the supply of coal for the current year have been placed at prices somewhat lower than last year; but, on the other hand, residual products are not so remunerative. The report announces the loss the Company have sustained by the deaths of two members of the Board during the past half year. Mr. W. W. Burkett, who died in March, was appointed a Director in October, 1907, and Mr. T. W. Fry, who died in May, had been a Director for 39 years. Both gentlemen "had been very valuable and hard-working members" of the Board. Mr. Edwin Bradley and Mr. H. Martyn Mowll have been appointed Directors in their places, and "it is believed will prove a very useful addition to the Board."

Fleetwood Gas Company.—A dividend at the rate of 6¼ per cent. per annum has been declared by this Company. The balance-sheet submitted to the shareholders showed a profit on revenue account for the six months to June amounting to £1216—this being about £300 short of the requirement for dividend and interest.

Proposed Extensions at Thirsk.—At the half-yearly meeting of the Thirsk Gas Company last Wednesday, dividends of 4 per cent. on the original shares and 3½ per cent. on the additional capital, free of income-tax, were agreed to. In their report, the Directors stated that they were considering the advisability of applying to the Board of Trade for powers to extend the gas-works and to raise more capital, and particulars of the proposals would be submitted to the shareholders.

Cork Gas Consumers' Company.—After placing £100 to the insurance fund and £1008 to the depreciation fund, the balance of profit and loss for the half year to June 30 is £7007. The Directors recommend payment of the ordinary dividend at the rate of 8 per cent. per annum, and 1s. per share as supplementary to the 87th dividend, for June 30, 1901, on the paid-up capital at that date, which dividend was at a reduced rate. The proposed payment will amount to £6869, and leave £138 to be added to the reserve fund.

Eastbourne Gas Company.—Dr. G. A. Jeffery presided at the half-yearly meeting last week, and said the Company were losing two valuable servants, men who had been with them for a great number of years. Mr. Harry Jones, the Consulting Engineer, had retired. The Company had profited by his experience for many years, and he had served them carefully and safely. He must, however, feel happy that his mantle had fallen upon his son, Mr. Frank Jones, who they hoped would prove to be, if not as good, then nearly as good, as the father. Another friend who was retiring was Mr. John Hammond, the Resident Engineer and Manager. He had been with the Company 27 years, and they would miss him very much. The report [*ante*, p. 414] was adopted; and in reply to a vote of thanks, the Chairman referred to the inauguration of a co-partnership scheme, which he hoped would prove a success.

Chemical Trade Boom.—According to the "Chemical Trade Journal," something in the nature of a boom is being experienced by the chemical trade of Lancashire and Cheshire, due to the impulse of certain home trades and the cutting-off of German supplies. Information from merchants and manufacturers shows that they are finding difficulty in executing orders, with which they have been inundated. By the textile trades there are steady inquiries, especially for the fine dyes, the production of which has been largely in German hands. In addition, there is promise of greater activity in foreign markets; and the outlook altogether is very bright indeed. Under the sudden demands prices have materially stiffened in many directions. In some trades in which the need for supplies is urgent the advances range from 50 to 75 per cent., and many offers of double prices have been made for early delivery.

PREPAYMENT METERS

WET AND DRY

Telephone Nos.
3289 (City) MANCHESTER.
2025 (Central) NOTTINGHAM.

Wires:
"SAWER MANCHESTER."
"SAWER NOTTINGHAM."

SAWER & PURVES
(BRANCH OF METERS LTD.)

MILES PLATTING
MANCHESTER

Scotch Agent: J. D. GIBSON
2, CAUSEYSIDE STREET
PAISLEY

RADFORD ROAD
NOTTINGHAM

Dumbarton Water Supply.—In the House of Commons last Thursday, the Dumbarton Burgh (Water, &c.) Order Confirmation Bill was considered, read the third time, and passed. The Bill received the Royal Assent next day.

Hastings and St. Leonard's Gas Company.—The report of the Directors of this Company and the accounts for the first half of the present year, to be submitted at Thursday's meeting of the shareholders, show that a profit balance of £11,544 is available for dividends—recommended at the rate of 6½ per cent. on the 5 per cent. converted stock, of 5 per cent. on the 3½ per cent. similar stock, and £6 1s. per cent. on the additional stock. The Board in their report state: "Fresh coal and oil contracts have recently been made at slightly reduced prices. The Company's mains have been extended to the borough boundary in Battle Road, Hollington, and to the Railway Cottages at Bopeep. There has been an increased demand for cooking-stoves and other domestic appliances."

Gloomy View of the Future of Gas.—We learn from the "American Gas Light Journal" that one outcome of the long-continued fight over gas-rates in St. Paul's (Minn.) was a similar demand in the sister city of Minneapolis, which has been answered by a voluntary reduction in price on the part of the Gas Company. This seems, however, only to have wetted the appetites of the agitators, and a proposition is now before the City Council to acquire the gas plant for the municipality. In discussing the question at a recent session, Alderman John Peterson opposed the proposition because in the last five years electricity had taken rapid steps forward. He said: "Even now they are using electrict current for fuel. You find electric stoves and other utensils in nearly every household. In ten years we will have forgotten how to use gas. It would be a big mistake for the city to take over the gas plant at this time. In a few years it would be an elephant on our hands. We couldn't cheapen the price of gas if we did take over the plant; and that's the only excuse we could possibly have for taking such action."

Worthing Gas Company.—At the half-yearly meeting of this Company last Saturday, the Chairman (Mr. H. H. Gardner), in moving the adoption of the report, stated that the effect of the six months' working, after payment of dividend, was to convert the balance of undivided profit, amounting to £20,127, into a balance of £19,625. No matter how good the working, the making or marring of the half-yearly accounts depended largely on the price of coal and the returns from residual products. These were the principal factors which had militated against the Company during the six months under review; but they were by no means singular in showing a reduced profit. It seemed to be the general experience of the gas industry. The Chairman concluded by referring to the retirement of the Engineer and General Manager (Mr. W. A. Walker), after thirty years' service, and the appointment of Mr. S. O. Stephenson as his successor. He spoke in high terms of Mr. Walker's work for the Company, as did also the Deputy-Chairman (Alderman Patching). The report was adopted, and a dividend at the rate of £5 5s. per cent. per annum declared. A retiring allowance of £250 per annum has been granted to Mr. Walker, to be paid during the pleasure of the Board.

Weston-super-Mare Gas Company.—The half-yearly general meeting of this Company was held last Friday—Mr. J. E. Norman, J.P., in the chair. The accounts were presented; and the meeting was held merely for the purpose of declaring a dividend. The Chairman stated that there had been a satisfactory increase of 3·48 per cent. in the sales of gas in the six months ended the 30th of June—viz., 112,665,200 cubic feet, compared with 108,882,100 cubic feet for the first half of 1913. The amount standing to the credit of the profit and loss account would enable the Directors to recommend the payment of the usual maximum statutory dividend of 5 per cent. on the ordinary stock without drawing upon the reserve fund, which stood at £10,512. Since the last half-yearly meeting, considerable progress had been made with the new works; and had it not been for the outbreak of war, it might have been possible to commence using them early next year. More than a dozen of the workmen had been called up, and in addition to an amount of ten guineas which the Directors decided to contribute towards the National Relief Fund, while these men were on Government duty they would either be granted half-pay or else the amount of their earnings under the Government would be brought up to what they would have been if at work. The co-partnership scheme continued to operate very satisfactorily; and he was of opinion that it was a great incentive for all to do their best for the Company. He concluded by moving the declaration of the dividend recommended; and the motion was carried unanimously.

Harrogate Gas Company.—At the half-yearly meeting of this Company last Wednesday, the Chairman (Mr. F. Barber) explained that the only object of holding it was to declare an interim dividend; and the figures before him showed that they were justified in acting in accordance with their usual practice. The estimated revenue for the half year was £7490, which exceeded by £532 the amount required to meet interest on debentures, dividends on preference stock, the interim dividend to be declared, and the usual statutory contribution to the reserve. After providing for the items referred to, there would be a carry-forward of £24,892. In face of the increased cost of coal, the reduction in the price of gas, and the diminished income from gas and residuals, this must, he thought, be regarded as entirely satisfactory. The erection of the vertical retorts was progressing very satisfactorily; and there was no reason to doubt that the Company would be in a position to produce gas from them by the agreed date—viz., the 30th of September. If the stock of coal had been correctly taken, a marvellous result had been achieved during the past half year by their new horizontal settings; for though they had carbonized 983 tons less coal than for the corresponding period of 1913, they had made 2,562,200 cubic feet more gas, or an average increase of 1064 cubic feet per ton. The payment of the interim dividend was sanctioned, and the Directors were authorized to subscribe £25 to the National Relief Fund and £25 to the Harrogate Local Relief Fund, and to make provision for the employees of the Company serving with His Majesty's Forces and their dependants.

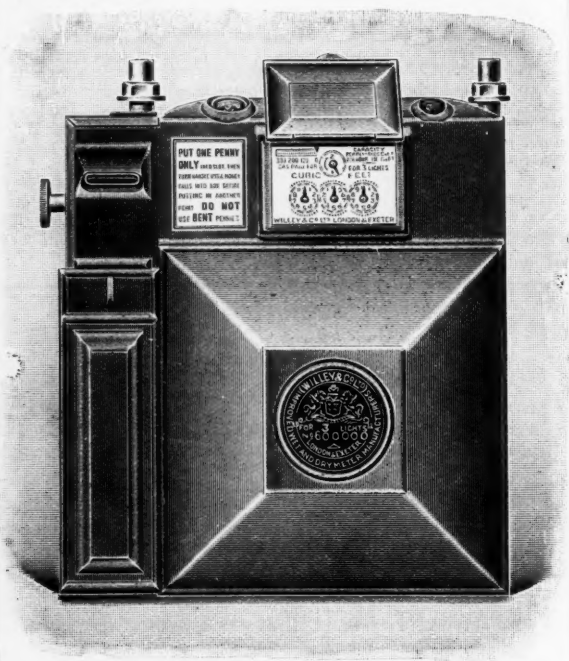
THREE POINTS

of advantage from the many found in our Slot Meters are:

1st.—They are Fraud Proof, and cannot be tampered with through the Slot.

2nd.—The Slot is closed when the maximum number of Coins have been inserted.

3rd.—Our Price-Changing System is the Simplest, Quickest, and most Accurate yet devised.



ALL PARTS INTERCHANGEABLE.

Tens of Thousands in use, and adopted exclusively by many Gas Companies.

WILLEY & CO., LTD.,

Exeter, London, Manchester, Leicester.

Telegrams:
"WILLEY, EXETER."
"GASVILLADO, KINLAND, LONDON."
"METERS, LEICESTER."

Telephone Nos.:
132 EXETER.
224 DALSTON, LONDON.
4777 LEICESTER.
7419 CITY (MANCHESTER).

LONDON WORKS & OFFICES:
91-95, Hertford Road, Kingsland, N.

MANCHESTER:
50, John Street, Chorlton-on-Medlock.

AGENTS FOR SCOTLAND:
D. M. NELSON & CO., 53, WATERLOO STREET, GLASGOW.

SOUTH METROPOLITAN GAS COMPANY,

709, Old Kent Road, S.E.

Shortly after the War broke out we were approached upon the subject of Thorium Nitrate, and informed of the great shortage, and that the market price might be taken at not less than 90/- per kilo.

We adopted this figure in placing our Stock at the disposal of the Gas Industry.

The actual cost entailed upon this Company by their policy of providing for such a contingency as that which has arisen works out at 98/6 per kilo.

F. W. McLEOD,

Secretary,

Aug. 29, 1914.

Colne Valley Water Company.

The shareholders had a very favourable report placed before them at the half-yearly meeting of the Company. The Chairman (Mr. C. E. Keyser) explained that the total amount of water-rates for the six months to June 30 was £28,882, whereas for the corresponding period of the previous year the figure was £27,655. The number of new buildings was 404, many of them being trade and manufacturing premises; while there are far fewer empty houses in the district than for several years past. During the six months 413 new supplies were added to the books, which will yield an annual revenue of £1100. The total number of supplies is now nearly 22,600; and the population of the area is estimated at 125,000. The consumption per head of the population for all purposes came to 29 gallons. There are now 272 miles of mains. There is a profit for the half year of £17,632, from which sum £1000 has been transferred to the contingency fund account. After paying interest on debenture and preference stocks, and recommending the full statutory dividends on the various classes of ordinary stock, in addition to 1 per cent. (actual) on account of back-dividends on the "A," "B," and "C" stocks, a balance of £9989 is carried forward.

Electricity Failure at Doncaster.—Considerable inconvenience was caused in the centre of Doncaster on Monday of last week, owing to the failure of the electricity supply. The cause of the failure is unknown; but from 8 o'clock until 8.30 some shops, entertainment places, residences, and hotels were compelled to resort to oil-lamps and candles for illumination. At the time a meeting of the Doncaster Distress Relief Fund was being held in the Mansion House; and in order to complete the business candles had to be requisitioned.

Southampton Water Supply.—The Southampton Corporation having applied to the Local Government Board for sanction to borrow £36,500 for the purposes of water supply, including the construction of a reservoir and the execution of certain other works there and at Otterbourne, Mr. R. S. Hetherington, M.Inst.C.E., one of the Board's Inspectors, held an inquiry last Tuesday into the subject-matter of the application. The Town Clerk (Mr. R. R. Linthorne) stated that the present population of Southampton was estimated at 123,948. The assessable value of the borough was £636,227 and the ratable value £662,846; while the produce of a general district rate of 1d. in the pound would realize £2518. In answer to the Inspector the Water Engineer (Mr. E. C. Rodda) stated that the daily demand for water varied from 3½ to 4 million gallons, and the reservoir capacity was barely sufficient to meet this. The Inspector took a mass of statistical and other information, and intimated that he would report in due course. There was no opposition to the application.

APPLICATIONS FOR LETTERS PATENT.

18,733.—Gee, B., and M'Intire, C. S., "Distributing-valve." Aug. 17.

18,763.—Wade H., "Fluid meters." A communication from O. A. Kreutzberg. Aug. 17.

18,796.—Smith, E. W., "Combined prepayment and coin-freed gas-meter." Aug. 18.

18,876.—Halford, A. C. F., "Reflection and diffusion of artificial light." Aug. 20.

18,948.—Robson, W. H., "Flash-lights for gas-burners." Aug. 22.

18,950.—Cadwallader, W. E., and Rogers, R. J., "Gas-fire." Aug. 22.

Winchester Water and Gas Company.—The report of the Directors [*ante*, p. 415] was adopted at the half-yearly meeting of the Company, on the motion of Mr. J. C. Warner, who presided. It was pointed out that the sales of both gas and water had increased during the past six months. In fact, during the time that Mr. H. C. Head has been Secretary and Engineer the output of both departments has nearly doubled. The net increase in the revenue was £200. A contract has been entered into by the Company with the London and South-Western Railway for lighting and heating both Winchester and Shawford stations; and the contract with the Corporation for lighting the city with gas has been renewed for five years—under terms, however, such as do not hold out hope of much profit to the undertaking. Every effort is to be made by the Company to provide work during the time of stress.

The Directors of the British Gaslight Company, Limited, will, at the half-yearly general meeting to be held later in this September, recommend (subject to audit) a dividend at the rate of 10 per cent. per annum, with a bonus of 5s. per share, for the half year ended June 30, both less income-tax, and payable in October.

The annual exhibition of flowers and vegetables, held recently at the South Metropolitan Gas-Works, East Greenwich Institute, was a great success. In performing the opening ceremony, Mr. Charles Carpenter, D.Sc., referred to gardening as an excellent hobby, indulgence in which tended to distract the mind from the present troubled conditions owing to the war. A vote of thanks was passed to him on the proposition of Mr. F. J. Bywater. Music by the "Metrogas" band was much enjoyed.

GAS COMPANIES IN THE STOCK EXCHANGE.

During the past week the Stock Exchange has remained closed; and the position of affairs continues to all appearances absolutely unchanged since the termination of the preceding week. The immediate future, too, regarding the reopening is still veiled in the same impenetrable obscurity. The problem however, has been, and is still, having intense consideration. There is no lack of would-be advisers with infallible expedients; but as unfortunately they are conflicting and discordant, and as measures which would be welcomed by one group would be ruinous to another, the solution is still out of sight. Meanwhile, some little private business has been done by those intent upon a good investment at cheap prices; but the general public seem mostly inclined to await the further development of the war.

For continuity of record, we reprint our last Official Quotations List, varied only in respect of recent capital issues. It will, of course, be borne in mind that the dividends paid by numerous companies in the month of August are necessarily not shown in the list.

OFFICIAL QUOTATIONS AT THE CLOSE OF THE STOCK EXCHANGE ON JULY 30.

Bank Rate (fixed Aug. 8), 5 per cent. Last year, 4½ per cent. Consols, —. Previous week, —.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59 –64	..	3 18 2
374,000	,,	July 10	4	Do. 4 p.c. Deb.	76–79	..	5 1 3
280,000	£	April 29	7½	Bombay, Ltd. . . .	5¼–6⅝	..	5 17 8
50,000	10	Feb. 26	16	Bourne- mouth Gas and Water Pref. 6 p.c.	29–30	..	5 6 8
373,480	10	,,	7		B 7 p.c. .	..	4 10 4
95,000	10	,,	6		15–15½	..	4 5 9
380,000	Stk.	Feb. 26	14	Brentford Consolidated	261–266	..	5 5 3
330,000	,,	,,	11	Do. New . . .	204–209	..	5 5 3
50,000	,,	,,	5	Do. 5 p.c. Pref. .	109–111	..	4 10 1
206,250	,,	June 11	4	Do. 4 p.c. Deb. .	91–93	..	4 6 0
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	208–213	..	5 3 4
244,200	,,	,,	8	Do. A Ord. Stk. .	154–159	..	5 0 8
530,000	20	Mar. 26	12½	British	44–45	..	5 11 1
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88–93	..	4 8 11
245,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85–87	..	4 12 0
100,000	10	—	—	Cape Town & Dis., Ltd.	1½–2½	..	—
100,000	10	—	—	Do. 4½ p.c. Pref. .	4–6	..	—
100,000	Stk.	June 23	4½	Do. 4½ p.c. Deb. Stk.	70–75	..	6 0 0
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord. . .	103–110	..	4 10 11
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106–108	..	5 1 2
560,000	,,	,,	5½	Do. 3½ p.c. do. .	103 –105	..	5 1 6
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	63½ –71½	..	4 3 11
800 000	Stk.	,,	4	Continental Union, Ltd.	76 –79	..	5 1 3
200 000	,,	,,	7	Do. 7 p.c. Pref.	115–118	..	5 18 8
4 ½,270	Stk.	—	6	Derby Con. Stk. . . .	123 –125	..	4 16 0
55,000	,,	—	4	Do. Deb. Stk. .	102–104	..	3 16 11
1,002,180	10	July 29	10	European, Ltd. . . .	17½ –18*	..	5 11 1
16,364,910	Stk.	Feb. 12	4 17/4	Gas Light and Coke	4 p.c. Ord. . .	..	4 15 6
2,603,000	,,	,,	3½		3½ p.c. max. .	..	4 8 7
4,062,235	,,	,,	4		4 p.c. Con. Pref.	..	4 0 10
4,674,850	,,	June 11	3		3 p.c. Con. Deb.	..	4 0 6
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87–89	..	5 12 4
70,000	10	April 23	11	Hongkong & China, Ltd.	16½ –16¾	..	6 11 4
131,000	Stk.	Mar. 12	7⅞†	Ilford A and C . . .	151 –154	..	5 2 4
65,780	,,	,,	6⅜†	Do. B	115 –118	..	5 8 0
65,500	,,	June 26	4	Do. 4 p.c. Deb. . .	92 –94	..	4 5 1
4,940,000	Stk.	May 14	9	Imperial Continental .	150 –160	..	5 12 6
1,235,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	84 –86	..	4 1 5
200,342	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c..	119 –121	..	5 7 5
561,000	Stk.	Feb. 26	10	Liverpool United A .	211 –213	..	4 13 11
718,100	,,	,,	7	Do. B .	146 –148	..	4 14 7
305,093	,,	June 26	4	Do. Deb. Stk.	97–99	..	4 0 10

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
75,000	5	June 11	0	Malta & Mediterranean	4⅛–4⅜	..	6 9 9
250,000	100	April 1	4½	Met. of Melbourne	4½ p.c. Deb.	99–101	.. 4 9 1
541,930	20	May 23	4	Monte Video, Ltd. . .		11½–12	.. 6 13 4
1,775,892	Stk.	July 29	4½	Newc'tle&G'tesh'd Con.		99⅝–99½	.. 4 10 6
529,705	Stk.	June 26	3½	Do. 3½ p.c. Deb.		82–83	.. 4 4 10
55,940	10	Feb. 26	7,14,0	North Middlesex 7 p.c.		14–15	.. 5 2 8
300,000	Stk.	May 14	8	Oriental, Ltd. . . .		117–122	.. 6 11 2
60,000	5	Mar. 26	10	Ottoman, Ltd. . . .		7⅞–7⅞	.. 6 9 0
60,000	50	Feb. 23	13	Portsea, Island B . .		128–131	.. 4 19 3
100,000	50	,,	12	Do. C . .		118–121	.. 4 19 2
249,980	5	April 29	8	Primitiva Ord. . . .		5⅛–6	.. 6 13 4
499,960	5	June 26	5	,, 5 p.c. Pref. .		4⅝–5	.. 5 0 0
521,600	100	June 2	4	,, 4 p.c. Deb. .		9⅝–93	.. 4 6 0
346,198	Stk.	June 26	4	River Plate 4 p.c. Deb.		85–87	.. 4 12 0
150,000	10	May 14	6	San Paulo	6 p.c. Pref.	10½–11	.. 6 9 1
125,000	50	July 1	5		5 p.c. Deb.	47–49	.. 5 2 0
135,000	Stk.	Mar. 12	10	Sheffield A		223–224	.. 4 9 3
209,984	,,	,,	10	Do. B		222–224	.. 4 9 3
523,500	,,	,,	10	Do. C		220–222	.. 4 10 1
90,000	10	May 28	9	South African . . .		10½–11½	.. 7 16 6
6,429,895	Stk.	Feb. 12	5/9/4	South Met., 4 p.c. Ord.		111–113	.. 4 16 8
1,895,445	,,	July 10	3	Do. 3 p.c. Deb.		72⅛–74⅛	.. 4 0 6
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.		157–159	.. 5 6 11
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.		114–116	.. 5 3 6
60,000	,,	,,	5	Do. 5 p.c. Pref. .		110–112	.. 4 9 3
137,058	,,	June 23	5	Do. 5 p.c. Deb. Stk.		116–118	.. 4 4 9
629,740	Stk.	May 14	5	Southampton Ord. . .		99–102	.. 4 18 0
120,000	Stk.	Feb. 12	7½†	Tottenham District	A 5 p.c. .	135–138	.. 5 8 8
742,275	,,	,,	6†		B 3½ p.c. .	115–117	.. 5 2 7
181,255	,,	June 26	4		4 p.c. Deb.	87–89	.. 4 9 11
182,380	10	Dec. 30	5	Tuscan, Ltd.		5–6	.. 8 6 8
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.		93–95	.. 5 5 3
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.		108½–109½	.. 4 11 4
80,000	Stk.	Feb. 26	8⅜	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.		151–156	.. 5 7 4
255,636	,,	,,	6⅝	,, B 3½ p.c.		129–134	.. 5 2 7
103,075	,,	,,	5/17/3	,, C 3½ p.c.		110–115	.. 5 2 0
852,000	,,	,,	6⅜	Wimbledon 5 p.c. .		117–122	.. 5 0 5
93,000	,,	,,	6⅜	Epsom 5 p.c. . . .		121–126	.. 5 5 2
83,416	,,	June 26	3	3 p.c. Deb. Stk. . .		66–69	.. 4 6 11

Prices marked * are "Ex Div." † Next Dividend will be at this rate.